7.0 Field Activities and Results for Fill Area North of Landfill No. 2, Parcel 230(7)

7.1 Introduction

The Fill Area North of Landfill No. 2, Parcel 230(7) is located in the north-central portion of the Main Post (Figure 1-2). This parcel is identified as a category 7 site in the EBS and, thus, is considered an area not previously evaluated or that requires additional investigation (ESE, 1998). The original CERFA parcel boundary for the Fill Area North of Landfill No. 2 is shown in Figure 7-1. Site investigation and fill area definition activities were conducted at this parcel to delineate the vertical and horizontal extent of waste fill and to characterize the fill material. The SI included a geophysical survey, field sampling and analysis, and monitoring well installation activities. Fill area definition activities included trenching and fill material sampling and analysis. This section presents the results of those activities.

The Fill Area North of Landfill No. 2 falls within a "Possible Explosive Ordnance Impact Area" shown on Plate 10 of the FTMC Archive Search Report, Maps (USACE, 1999b) and, thus, the UXO avoidance procedures described in Section 2.1 were implemented at this parcel.

7.2 Site Description

The Fill Area North of Landfill No. 2 is located a short distance northeast of Landfill No. 2 and north of the Ammunition Supply Point (ASP) (Figure 1-2). This parcel is also known as the Fill Area North of ASP. The Fill Area is located immediately east of an unimproved road extending north from the Chemical Defense Training Facility access road. The eastern and southern boundary of the site are within the floodplain of Cave Creek, which flows to the south-southwest adjacent to the site (Figure 1-5). This site is identified as a ground scar on the 1961 aerial photo composite (ESE, 1998). Rusted drum parts, other metal, and construction and demolition debris have been observed at this parcel. It appears that materials were dumped down the eastern slope of the fill area toward Cave Creek from the unimproved road. The site is now overgrown with vegetation and has large trees growing between the base of the slope on the east side of the site and Cave Creek.

The original CERFA parcel boundary encompasses approximately 2 acres. Surface elevations range from approximately 830 feet above msl near the unimproved road to 805 feet above msl near Cave Creek at the base of the slope. Shallow groundwater flow at the site appears to be controlled by topography and flows to the east-southeast because of the proximity of the site to Cave Creek.

7.2.1 Site Geology

The soils at this site are of the Atkins series and consist of poorly drained, strongly acid soils that are developing on alluvium (USDA, 1961). This parent material has washed mainly from soils underlain by sandstone and shale. The Atkins surface soils are dark grayish-brown, mottled silt loam. The subsoils are light brownish-gray to light olive-gray, mottled silt loam or clay loam. The Atkins soils occur mainly in small, narrow bands in flood plains along streams in Calhoun County.

Bedrock beneath the Fill Area North of Landfill No. 2 has been mapped as Cambrian Shady Dolomite. The unimproved road along the western boundary of this parcel roughly coincides with the north-south trending contact between the Shady Dolomite and the Cambrian Chilhowee Group (also present beneath the southwestern corner of the parcel). Quaternary alluvium occupies the drainage associated with Cave Creek (Osborne et al, 1997). A geologic map of the area, including the Fill Area North of Landfill No. 2 is presented in Figure 1-3.

7.2.2 Site Hydrogeology

IT installed three shallow, temporary groundwater monitoring wells near the toe of the fill area as part of the SI. Static groundwater elevations were measured in the temporary wells on March 13, 2000. Table 7-1 summarizes measured groundwater elevations at the Fill Area North of Landfill No. 2. Field procedures for measuring water levels are described in Section 2.6.3. Monitoring well locations and potentiometric surface contours based on the March 2000 results are shown in Figure 1-4. Groundwater was encountered during drilling at depths of approximately 1.5 to 5.5 feet bgs. The shallow depth to groundwater reflects the proximity of the wells to Cave Creek. The groundwater gradient follows the topographic gradient of the creek and the calculated average horizontal gradient is approximately 0.02 ft/ft. Groundwater elevations at the site range from 810.24 to 801.54 feet above msl. Well development records indicate that a sustainable flow rate for all three wells would be less than 0.5 gpm.

7.2.3 Surface Hydrology

Cave Creek flows from north to south near the eastern perimeters of the fill area. Two intermittent seeps were observed and sampled during the February 1999 sampling event. The seeps were observed at the toe of the fill area and discharged into Cave Creek. During previous site visits in 1998, the seeps were not observed. Seep locations are indicated in Figure 7-1.

7.3 Site Investigation

The SI was conducted prior to the fill area definition investigation to characterize the source of COPCs in various site matrices, determine the nature and extent of contamination, and to provide data to evaluate the level of risk to human health and the environment posed by releases of the COPCs. The SI included field work to collect seven surface soil samples, three depositional soil samples, seven subsurface soil samples, three groundwater samples, three surface water samples, three sediment samples, and three seep samples. The fill area definition included trenching, soil borings, and fill material sampling. This section summarizes SI activities including the geophysical survey, environmental sampling and analysis, and monitoring well installation activities.

7.3.1 Geophysical Survey

IT conducted a grid-based geophysical survey at the Fill Area North of Landfill No. 2 from February 1999 to May 1999. Based on analysis of site magnetic and EM data, the geophysical interpretation map (Figure 7-2) shows the locations of landfill pits, an anomalous high conductivity area, isolated buried metallic objects, and areas of surface metallic debris. The geophysical site interpretation map includes detailed information on permanent site reference features (e.g., asphalt and dirt roads, topographic slopes, pipelines, and culverts), so that the site boundaries and geophysical anomaly locations can be relocated in the future. The site reference information shown on the geophysical interpretation map was translated from a hand-sketched site map generated in the field. Further detail on the site geophysical survey lines is provided in the Geophysical Survey Report for Fill Area North of Landfill No. 2 (Appendix A). The total area surveyed was approximately 115,300 square feet (2.7 acres).

Geophysical data analysis indicates several landfill pits ranging from low to moderate concentrations of buried metal, and numerous isolated buried metallic objects/debris exist within site boundaries (Figure 7-2). The geophysical interpretation map also shows the locations of individual surface metal objects and areas of low to moderate concentrations of surface metal. One such area of primarily low concentrations of surface metal is located along a steep topographic slope that dips east-southeast toward Cave Creek.

An area of anomalous high conductivity readings occurs in the southern portion of the site. Nearby metallic debris is absent, and the exact cause of the elevated conductivity readings is uncertain. Possible reasons for the conductivity anomaly include surface disposal or placement of conductive fill materials, or near-surface soil contamination migrating away from nearby metallic source areas.

7.3.2 Well Installation

Seven soil borings and three temporary groundwater monitoring wells were installed at the site as part of the SI conducted by IT. Boring and monitoring well locations are shown in Figure 7-1. Well construction details are provided in Table 7-2. Well construction diagrams are included in Appendix C. Temporary well installation procedures are described in Section 2.6.1.

Based on soil sampling, borings PPMP-230-GP04 and PPMP-230-GP06 appear to have penetrated the fill material. The boring log for location PPMP-230-GP04 indicates fill material was encountered between 5 and 7 feet with pieces of brick at about 5 feet bgs. The boring log for location PPMP-230-GP06 indicates backfill material from 4 feet to 8 feet bgs. Fill material was not observed in any other SI borings drilled at the Fill Area North of Landfill No. 2. The boring logs are presented in Appendix C.

7.3.3 Environmental Sampling

The environmental sampling performed during the SI included the collection and chemical analysis of surface and depositional soil samples, subsurface soil samples, surface water samples, sediment samples, seep water samples, and groundwater samples. Sample collection techniques are described in Section 2.3. Sample collection logs and chain-of-custody records are included in Appendix B. Analytical results were compared to background screening values, residential human health SSSLs, and ESVs.

7.3.3.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from seven locations and depositional soil samples were collected from three locations (Figure 7-1). Surface and depositional samples were collected from the upper 1-foot of soil. Analytical results are presented in Table 7-3.

Metals. Twenty metals were detected in the surface soil samples and nineteen metals were detected in the depositional soil samples collected. The concentrations of lead, mercury, selenium, and zinc exceeded the background screening values and ESVs in various samples. Arsenic and iron concentrations in all surface soil and depositional soil samples exceeded the SSSLs. The aluminum concentration in the surface soil sample collected from location PPMP-230-GP07 also exceeded the SSSL. The concentrations of aluminum, arsenic, and iron were all within the background screening values. All surface soil and depositional soil samples collected had concentrations of aluminum, chromium, iron, and vanadium that exceeded the ESVs.

Volatile Organic Compounds. Eleven VOCs were detected in the surface and depositional soil samples collected. None of the detected VOC concentrations exceeded the SSSLs. The surface sample collected from location PPMP-230-GP05 had a concentration of m,p-xylenes that exceeded the ESV.

Semivolatile Organic Compounds. Six SVOCs were detected in one surface soil sample collected from location PPMP-230-GP04. None of the SVOCs detected exceeded the SSSLs.

Pesticides. Two pesticides were detected in surface soil samples collected from locations PPMP-230-GP04 and PPMP-230-GP06. None of the detected concentrations exceeded the SSSLs; however, all concentrations exceeded the ESVs . Pesticides were not detected in the three depositional soil samples collected.

No herbicides, explosives, or PCBs were detected in the surface and depositional soil samples collected.

7.3.3.2 Subsurface Soil Sampling

Subsurface soil samples were collected for chemical analysis from seven soil boring locations at the Fill Area North of Landfill No. 2. Subsurface soil samples were collected from various intervals ranging from 1 to 12 feet bgs. Sampling locations are shown in Figure 7-1. Analytical results are presented in Table 7-4.

Metals. Twenty-two metals were detected in subsurface soil samples collected. The concentrations of four metals (arsenic, barium, iron, and lead) exceeded the background screening values and SSSLs in the sample collected from location PPMP-230-GP04 and chromium and iron exceeded both the background screening value and the SSSL in the sample collected from location PPMP-230-GP05.

Selenium exceeded the background screening value in the subsurface soil samples collected from locations PPMP-230-GP02, PPMP-230-GP03, PPMP-230-GP04, and PPMP-230-GP05. Fifteen metals detected in the subsurface soil sample collected from location PPMP-230-GP04 exceeded the background screening values.

Volatile Organic Compounds. Five VOCs were detected in subsurface soil samples collected; however, none exceeded the SSSLs.

Semivolatile Organic Compounds. Eight SVOCs were detected in subsurface soil samples. One SVOC (benzo[a]pyrene) detected in the sample collected from location PPMP-230-GP06 exceeded the SSSLs.

Pesticides. Three pesticides were detected in the subsurface soil sample collected from location PPMP-230-GP07; however, none of the detected pesticides exceeded the SSSLs.

No herbicides, explosives, or PCBs were detected in the subsurface soil samples collected.

7.3.3.3 Groundwater Sampling

Groundwater samples were collected from the three temporary wells at the Fill Area North of Landfill No. 2. Well/groundwater sampling locations are shown in Figure 7-1. Analytical results are presented in Table 7-5. Field parameters are provided in Table 7-6.

Metals. Twelve metals were detected in the groundwater samples collected. Manganese exceeded the SSSLs and the background screening values in the three groundwater samples collected. Aluminum and iron exceeded the SSSLs and background screening values in the groundwater samples collected from locations PPMP-230-GP01 and PPMP-230-GP02. Barium was detected at a concentration exceeding both the SSSL and background screening value in the groundwater sample collected from location PPMP-230-GP02.

Several metals were detected at concentrations exceeding the SSSLs and background screening values. However, the majority of these metals were present in groundwater samples that had high turbidity (greater than 100 NTUs) at the time of sample collection. To evaluate the effects of turbidity on metals and concentrations in groundwater at FTMC, IT resampled five wells that previously had high turbidity using a "low-flow" groundwater purging and sampling technique to reduce turbidity to below 10 NTUs. The resampling effort demonstrated that the concentrations of most metals in the lower turbidity samples were significantly lower (1 to 2 orders of magnitude) than in the higher turbidity samples (IT, 2000c) (Appendix G). Consequently, the elevated metals results in the groundwater samples collected from locations PPMP-230-GP01 and PPMP-230-GP02 are likely the result of high turbidity.

Volatile Organic Compounds. Nine VOCs were detected in the groundwater samples collected. None of the VOCs detected exceeded the SSSLs. Eight VOCs, detected in various samples, were flagged with a "B" data qualifier signifying that these compounds were also detected in an associated laboratory or field blank.

Semivolatile Organic Compounds. One SVOC was detected in the groundwater sample collected from location PPMP-230-GP01; however, the result did not exceed the SSSL.

No herbicides, pesticides, explosives, or PCBs were detected in the groundwater samples collected.

7.3.3.4 Surface Water Sampling

Three surface water samples were collected at the Fill Area North of Landfill No. 2. The surface water samples were collected from Cave Creek located east of the site at sample locations shown in Figure 7-1. Field parameters are provided in Table 7-6. Analytical results are presented in Table 7-7.

Metals. Eight metals were detected in the surface water samples collected. The surface water sample collected from location PPMP-230-SW/SD01 had a concentration of thallium exceeding the SSSL, ESV, and background screening value; however, the result was flagged with a "B" data qualifier. Two metals (aluminum and barium) exceeded the ESVs; however, the aluminum result from location PPMP-230-SW/SD03 was flagged with a "B" data qualifier.

Semivolatile Organic Compounds. One SVOC (bis[2-ethylhexyl]phthalate) was detected in the surface water sample collected from location PPMP-230-SW/SD03 at a concentration that exceeded the ESV.

No pesticides, herbicides, explosives, PCBs, or VOCs were detected in the surface water samples collected.

7.3.3.5 Sediment Sampling

Three sediment samples were collected for chemical analysis at the Fill Area North of Landfill No. 2. The sediment samples were collected from Cave Creek at the sample locations shown in Figure 7-1. Analytical results are presented in Table 7-8.

Metals. Seventeen metals were detected in the sediment samples collected. The sediment sample collected from location PPMP-230-SW/SD03 had a concentration of mercury exceeding the background screening value and the ESV. No other metals exceeded the ESVs, SSSLs, or background screening values.

Volatile Organic Compounds. Three VOCs were detected in the sediment samples collected. None of the detected concentrations exceeded the SSSLs or the ESVs.

Semivolatile Organic Compounds. Two SVOCs were detected in the sediment samples collected. The concentrations of di-n-butylphthalate in the sediment sample collected from location PPMP-230-SW/SD01 exceeded the ESV; however, the analytical result was flagged with a "B" data qualifier. No other SVOCs exceeded the SSSLs or ESVs.

Pesticides. Two pesticides were detected in the sediment sample collected from location PPMP-230-SW/SD03; however, the reported concentrations did not exceed the ESVs or the SSSLs.

No herbicides, explosives, or PCBs were detected in the sediment samples collected.

7.3.3.6 Seep Samples

Three seep samples were collected for chemical analysis at the Fill Area North of Landfill No. 2 at locations shown in Figure 7-1. Analytical results are presented in Table 7-9.

Metals. Ten metals were detected in the seep samples collected. The concentration of manganese in the sample collected from location PPMP-230-SEP02 exceeded the background screening value, SSSL, and ESV. Aluminum and barium concentrations exceeded the ESVs in all three samples. Iron and lead exceeded the ESVs in two of the seep samples collected; however, the lead results were all flagged with a "B" data qualifier. Calcium was detected in the seep sample collected from location PPMP-230-SEP01 and potassium was detected in the seep sample collected from location PPMP-230-SEP03 at concentrations that exceeded the background screening values but not the SSSLs or ESVs.

Volatile Organic Compounds. Acetone was detected in the seep samples collected from locations PPMP-230-SEP01 and PPMP-230-SEP03; however, the reported acetone concentration did not exceed the SSSL or ESV.

No herbicides, pesticides, explosives, PCBs, or SVOCs were detected in the seep samples collected.

7.4 Fill Area Definition Activities

This chapter summarizes fill area definition activities conducted by IT at the Fill Area North of Landfill No. 2. Fill area definition activities included trenching, soil borings, and fill material sampling and analysis.

7.4.1 Trenching Activities

Five exploratory trenches were excavated at the Fill Area North of Landfill No. 2 to characterize the horizontal and vertical extent of the fill area. Trenches were excavated to depths ranging from 2 to 7 feet bgs. Trench location T230-1 was placed to characterize the eastern horizontal extent, location T230-2 and T230-3 were placed to characterize the northern horizontal extent, location T230-4 was placed to characterize the northwestern extent, and location T230-5 was placed to characterize the western extent of the fill area. Trench locations are shown in Figure 7-1. Trenching data are summarized in Table 7-10. Trenching procedures are described in Section 2.8. Trenching logs are presented in Appendix I.

Fill materials observed in all of the trenches included: metal bars/pipes, wiring, glass bottles/jars, red bricks, light gray sand and clay, orange/red sand and clay, black clay pipe, piece of 100 pound concrete bollard shaped like a bomb, ceramic pieces, cement blocks, metal u-rings, pieces of a 55-gallon metal drum, gravel, asphalt, empty shotgun shell, burned wood, burned newspaper, burned roots, and tin foil. The trenches contained varying amounts of steel/metal material, which correspond to the varying concentrations of "buried metal" anomalies shown in the geophysics report. The anomalies shown as “elevated conductivity” on the geophysical report correspond to the trenches containing varying amounts of disturbed clay and low amounts of metal material.

Based on the results of the exploratory trenching at the Fill Area North of Landfill No. 2, the horizontal extent of the fill area has been defined, as illustrated in Figure 7-3. The approximate extent of the fill area at this parcel covers 2.4 acres.

7.4.2 Fill Material Borings

One boring was installed to a depth of 18 feet bgs at the Fill Area North of Landfill No. 2; however, because of an obstruction and the potential UXO hazard, the soil boring location was moved approximately 27 feet southeast of its proposed location. The fill material boring log is included in Appendix C and includes detailed characterization of the fill material encountered. Table 7-11 provides a summary of fill material boring information.

One fill material sample was collected for chemical analysis from the boring at location FA-230-SB01 (Figure 7-1). The sample was analyzed for the parameters listed in Section 2.4. Analytical results were compared to the SSSLs and background screening values, as presented in Table 7-12. Sample collection logs and chain-of-custody records are presented in Appendix B.

Metals. Nineteen metals were detected in the fill material sample collected. Concentrations of aluminum, arsenic, and iron exceeded the SSSLs. Concentrations of beryllium, calcium, copper, lead, magnesium, potassium, and zinc exceeded the background screening values.

Volatile Organic Compounds. Two VOCs (acetone and methylene chloride) were detected in the fill material sample collected. Neither compound exceeded the SSSLs or ESVs.

Semivolatile Organic Compounds. Sixteen SVOCs were detected in the fill material sample collected. Benzo(a)pyrene was detected at a concentration exceeding the SSSLs. None of the reported concentrations exceeded the ESVs.

Pesticides. Four pesticides were detected in the fill material sample collected. Pesticides 4,4'-DDD, Aldrin, and Dieldrin exceeded the SSSLs.

PCBs. One PCB (Aroclor 1260) was detected in the fill material sample at a concentration exceeding the SSSL.

No herbicides or explosives were detected in the fill material samples collected.

7.5 Extent of Fill Material

IT has estimated the vertical and horizontal extent of fill material at the Fill Area North of Landfill No. 2 based on information gathered from previous site investigations and trenching and boring activities discussed in this report. The fill area covers approximately 2.4 acres, as shown in Figure 7-3. The average depth of fill material estimated from the trench and boring log data is approximately 15 feet bgs.

7.6 Variances

Two variances to the work plans were recorded during the completion of the SI and fill area definition investigation at the Fill Area North of Landfill No. 2. The variances did not alter the intent or results of the investigations. Variances to the proposed scope of work are summarized in Table 7-13 and included in Appendix K.

8.0 Field Activities and Results for Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7)

8.1 Introduction

The Fill Area East of Reilly Airfield, Parcel 227(7) and the Former Post Garbage Dump, Parcel 126(7) are adjacent sites located in the northern portion of the Main Post at the eastern end of Reilly Airfield (Figure 1-2). These parcels are identified as category 7 sites in the EBS and, thus, are considered areas not previously evaluated or that require additional investigation (ESE, 1998). Because they are contiguous sites, the Fill Area East of Reilly Airfield and the Former Post Garbage Dump were investigated together and are both discussed in this section. The original CERFA parcel boundaries for these sites are shown in Figure 8-1. Site investigation and fill area definition activities were conducted at these parcels to delineate the vertical and horizontal extent of waste fill and to characterize the fill material. This section presents the results of those activities.

There are no records of disposal activities that may have occurred at the Fill Area East of Reilly Airfield or the Former Post Garbage Dump and, thus, the SI was conducted to determine the presence or absence of COPCs at these sites. The SI included a geophysical survey, field sampling and analysis, and monitoring well installation activities. Following the SI, fill definition activities were conducted to determine the vertical and horizontal extent of the fill area and characterize the fill material. Fill area definition activities included trenching and fill material sampling and analysis.

8.2 Site Description

The Fill Area East of Reilly Airfield is bounded on the west by Reilly Lake, on the north by trees and dense foliage and the adjacent Former Post Garbage Dump, on the east by trees, and on the south by Reilly Airfield (Figure 1-2). The site contains several potential disposal areas identified in the EPIC report (EPA, 1990). The EPIC aerial photo composite dated 1949 annotates two ground scars with the label "Fill Area." The aerial photo composite dated 1961 annotates one site as "Pit" and another as "TR" (trench). This parcel encompasses the four sites identified by EPIC. The parcel also includes an adjacent area of disturbed ground that was not identified in the EPIC report, but which appeared to possibly contain mounded material (ESE, 1998).

The original CERFA parcel encompassed an area of approximately 22 acres. The elevation of the site is approximately 755 feet above msl and the ground slopes to the north-northwest toward

Reilly Lake. Site visits by IT revealed several drums and other discarded material on the northern boundary. The area is densely vegetated and the precise location and site boundaries were not clearly defined. Information regarding operations at this parcel is not available.

The Former Post Garbage Dump is located near the northern boundary of the Main Post east of Reilly Lake (Figure 8-1). The parcel covers approximately 1.6 acres. The site is bounded on the south by the Fill Area East of Reilly Airfield. Parcel 126(7) is bounded on the west, east, and north by undeveloped land. The site consists of a steep north-facing slope that borders a wetland. The crest, slope, and slope toe all face north to northeast and there is a wetland extending east to west across the toe of the slope and toward Reilly Lake. Shallow groundwater at the site is probably controlled by surface drainage and/or topography. Site elevation is approximately 725 to 755 feet above msl.

8.2.1 Site Geology

Soils underlying the Fill Area East of Reilly Field and the Former Post Garbage Dump are mapped as Cumberland gravelly loam, 2 to 6 percent slopes, eroded type soil (CoB2) (USDA, 1961). The thickness of the alluvium ranges from 2 to 15 feet or more, and in some areas overlie beds of gravel or sand. These soils have developed in old alluvium that washed from soils derived mainly from limestone and cherty limestone, and to some extent, shale and sandstone. Rounded chert, sandstone, and quartzite gravel, as large as 3 inches in diameter, are on and in the soil.

Bedrock beneath Fill Area East of Reilly Field, Parcel 227(7), and the Former Garbage Dump, Parcel 126(7) is mapped as the Cambrian Conasauga formation. The Cambrian Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989). A geologic map of the area, including the Fill Area East of Reilly Airfield is presented in Figure 1-3.

Lithologic logs from the borings drilled for the installation of 16 temporary groundwater monitoring wells are presented in Appendix C. The borings were drilled into residuum consisting of red to mottled brown silts, clays, and minor clayey sands, with few thin gravels. Some intervals contained chert nodules.

8.2.2 Site Hydrogeology

IT installed 16 temporary wells at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump at the locations shown in Figure 8-1. Static groundwater elevations were

measured in the temporary wells on March 13, 2000. Table 8-1 summarizes measured groundwater elevations that ranged from approximately 721 to 742 feet above msl. Field procedures for measuring water levels are described in Section 2.6.3. A potentiometric surface map was constructed from the March 2000 data and is shown in Figure 1-4. The generalized direction of groundwater flow at the site is predominantly north on the western portion of the site, northwest along the northern edge of the site, and almost due west along the eastern side of the site. The average horizontal hydraulic gradient varies across the site from approximately 0.1 to 0.01 ft/ft.

During boring and well installation activities, groundwater was generally encountered in clayey sand zones at depths ranging from 2 to 35 feet bgs.

8.2.3 Surface Hydrology

The land surface at the Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7) is relatively flat with only a slight slope to the north and west. Surface run off appears to follow topography and generally flows into either an unnamed, intermittent tributary to Reilly Lake located along the northern boundary of the Parcel 227(7) or directly into Reilly Lake.

8.3 Previous Site Characterization

IT conducted an SI to identify COPCs in various site matrices, characterize the source of COPCs, determine the nature and extent of COPCs, and support the evaluation of the level of risk to human health and the environment posed by potential releases of the COPCs. The SI included field work to collect three surface soil samples, thirteen subsurface soil samples, thirteen groundwater samples, five surface water samples, five sediment samples, and three depositional soil samples at the Fill Area East of Reilly Airfield. At the Former Post Garbage Dump, IT collected three surface soil, three subsurface soil, three surface water, three groundwater, three depositional soil, and three sediment samples. This section summarizes SI activities including the geophysical survey, environmental sampling and analysis, and monitoring well installation.

8.3.1 Geophysical Survey

IT conducted a grid-based geophysical survey at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump from September 1998 to March 1999. IT utilized the results of the geophysical survey to aid in the placement of subsurface soil sampling locations. These data were used to determine the horizontal and vertical extent of waste fill and direct subsequent fill

area definition activities. The geophysical survey was performed as described in Section 2.2. The total area surveyed was approximately 32 acres. A detailed discussion of the geophysical investigation, including theory of operation of instruments, field procedures, data processing, and interpreted results of the investigation are presented in Appendix A.

Based on analysis of site magnetic and EM data, the geophysical interpretation map (Figure 8-2) shows the locations of large-scale disposal areas, landfill pits, anomalous high conductivity areas, isolated buried metallic objects, and surface metallic debris. The geophysical site interpretation map includes detailed information on permanent site reference features (e.g., asphalt and dirt roads, surface mounds and depressions, creeks, and the airfield), so that the site boundaries and geophysical anomaly locations can be relocated in the future. The site reference information shown in the geophysical site interpretation map was translated from a hand-sketched site map generated in the field.

Geophysical data analysis indicates several landfill pits ranging from low to high concentrations of buried metal, and numerous isolated buried metallic objects exist within site boundaries (Figure 8-2). The geophysical site interpretation map also shows the locations of individual surface metal objects and areas of low to moderate concentrations of surface metal, such as that associated with the Reilly Lake Campground located in the northwest corner of the site. Geophysical anomalies located in the northern part of the site within approximate coordinates 800 to 1,160E and 550 to 750N are interpreted to be caused by generally high concentrations of buried metal representing the Former Post Garbage Dump. To the east of the Former Post Garbage Dump, several anomalies are interpreted to be caused by landfill pits containing low to high concentrations of buried metal, as indicated in Figure 8-2. The central and south-central portions of the site are characterized by large areas containing low concentrations of buried metal, with isolated landfill pits containing low-to-moderate and moderate concentrations of buried metal. From analysis of the magnetic data, most of the locations indicated as low concentration buried metal are thought to represent small metal objects scattered over large areas.

Two areas of anomalously high conductivity readings also occur in the south-central portion of the site. The western-most anomaly extends over a broad area between the southern boundary of several surface mounds mapped in the area and the Reilly Airfield. The exact cause of the elevated conductivity readings is uncertain. Possible reasons for the conductivity anomalies include: 1) surface disposal or placement of conductive fill materials, 2) a local increase in the volume of fine-grained soils at the surface associated with construction activities at the airfield,

3) near-surface soil contamination migrating southward from the area of surface mounds, or 4) a local increase in depth to bedrock. The latter possible anomaly source is deemed more unlikely than the others because of correlation between the EM and magnetic data showing low to moderate concentrations of buried metal throughout the area.

8.3.2 Well Installation

Thirteen temporary wells were installed in the residuum groundwater zone at the Fill Area East of Reilly Airfield and three temporary wells were installed at the Former Post Garbage Dump. The well/groundwater sample locations are shown in Figure 8-1. Table 8-2 summarizes construction details of the wells installed. The well construction logs are included in Appendix C. Temporary well installation procedures are described in further detail in Section 2.6.1.

8.3.3 Environmental Sampling

The environmental sampling performed during the SI included the collection of surface soil, subsurface soil, surface water, sediment, groundwater, and depositional soil samples for chemical analysis. Sample collection techniques are described in Section 2.3. Sample collection logs and chain-of-custody records are provided in Appendix B. Analytical results were compared to background screening values, residential human health SSSLs, and ESVs.

8.3.3.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from six locations and depositional soil samples were collected from seven locations at the Former Post Garbage Dump and the Fill Area East of Reilly Airfield. Sampling locations are shown in Figure 8-1. Surface and depositional samples were collected from the upper 1-foot of soil. Analytical results are presented in Table 8-3.

Metals. Nineteen metals were detected in the surface and depositional soil samples collected. The concentrations of three metals (arsenic, iron, and manganese) exceeded the SSSLs in most of the surface and depositional soil samples collected; however, the concentrations of arsenic and iron were within the background screening values. Manganese exceeded the background screening values, ESVs, and SSSLs in the sample collected from location PPMP-227-DEP01.

The concentrations of five metals (aluminum, chromium, iron, manganese, and vanadium) exceeded the ESVs in the surface and depositional soil samples collected; however, the concentrations of these metals were within the background screening values. Lead and mercury concentrations present in two samples exceeded the background screening values and the ESVs.

Selenium concentrations present in seven samples exceeded the background screening values and the ESVs. Zinc concentrations present in one sample exceeded the background screening values and the ESVs.

Volatile Organic Compounds. Nine VOCs were detected in the surface and depositional soil samples collected. None of the detected VOC concentrations exceeded the SSSLs. The depositional soil sample collected from location FTA-126-DEP01 had a detectable concentration of trichloroethene exceeding the ESV; however, the result was flagged with a "B" data qualifier signifying that the compound was also detected in an associated laboratory or field blank.

Pesticides. Two pesticides were detected in surface soil sample collected from location PPMP-227-GP16. Pesticides were not detected in the seven depositional soil samples or the remaining five surface soil samples. Both of the detected pesticides were present at concentrations exceeding the ESVs.

No herbicides, explosives, PCBs, or SVOCs were detected in the surface and depositional soil samples collected.

8.3.3.2 Subsurface Soil Sampling

Subsurface soil samples were collected from thirteen locations at the Fill Area East of Reilly Airfield and three locations at the Former Post Garbage Dump for chemical analyses. Subsurface soil samples were collected at various intervals ranging from 1 to 12 feet bgs. Sampling locations are shown in Figure 8-1. Analytical results are presented in Table 8-4.

Metals. Twenty-one metals were detected in the subsurface soil samples collected. All of the subsurface soil samples collected had detectable concentrations of arsenic and iron exceeding the SSSLs and eight of the thirteen subsurface soil samples collected had detectable concentrations of manganese exceeding the SSSLs. The subsurface soil samples collected from location PPMP-227-GP02 had detectable concentrations of chromium exceeding the SSSLs and the background screening values.

Arsenic exceeded both the SSSL and background screening value in the sample collected from location PPMP-227-GP01 and manganese exceeded both the SSSL and background screening value at three sample locations.

Volatile Organic Compounds. Nine VOCs were detected in subsurface soil samples collected; however, none of the detected VOCs exceeded the SSSLs.

Semivolatile Organic Compounds. Three SVOCs were detected in the subsurface soil samples collected; however, none of the concentrations exceeded the SSSLs.

Pesticides. Two pesticides were detected in the subsurface soil samples collected. Neither pesticide detected was present at a concentration exceeding the SSSLs.

No herbicides, explosives, or PCBs were detected in any subsurface soil sample collected.

8.3.3.3 Groundwater Sampling

Groundwater was sampled from the thirteen temporary wells at the Fill Area East of Reilly Airfield and the three wells located at the Former Post Garbage Dump. Well/groundwater sampling locations are shown in Figure 8-1. Sample collection logs and chain-of-custody records are presented in Appendix B. Analytical results are presented in Table 8-5. Field parameter measurements are provided in Table 8-6.

Metals. Nineteen metals were detected in the groundwater samples collected. The groundwater samples collected from locations FTA-126-GP01, FTA-126-GP02, PPMP-227-GP02, PPMP-227-GP03, PPMP-227-GP05, PPMP-227-GP07, PPMP-227-GP08, PPMP-227-GP09, PPMP-227-GP10, PPMP-227-GP11, PPMP-227-GP12, and PPMP-227-GP13 each had detectable concentrations of metals (aluminum, arsenic, barium, beryllium, copper, iron, lead, manganese, thallium, and vanadium) exceeding both the SSSLs and background screening values. The thallium results were flagged with a "B" data qualifier.

Metals exceeding the SSSLs and background screening values in four of these samples (PPMP-227-GP02, PPMP-227-GP05, PPMP-227-GP07, and PPMP-227-GP12) are attributed to high turbidity (greater than 100 NTUs) in the samples (Table 8-6).

Volatile Organic Compounds. Two VOCs were detected in groundwater samples collected. Four groundwater samples collected had detectable concentrations of acetone and one sample location had a detectable concentration of bromomethane; however, none of the results exceeded the SSSLs.

Semivolatile Organic Compounds. One SVOC was detected in a groundwater sample collected; however, it was not present at a concentration exceeding the SSSL.

Herbicides. One herbicide was detected in one groundwater sample collected. The detected herbicide was not present at a concentration exceeding the SSSL.

No pesticides, explosives, or PCBs were detected in the groundwater samples collected.

8.3.3.4 Surface Water Sampling

Five surface water samples were collected at the Fill Area East of Reilly Airfield; however, the sample collected from location PPMP-227-SW/SD05 was only analyzed for explosives. Three surface water samples were collected at the Former Post Garbage Dump. Surface water sample locations are shown in Figure 8-1. Field parameter measurements are provided in Table 8-6. Analytical results are presented in Table 8-7.

Metals. Eleven metals were detected in the surface water samples collected. Three surface water samples collected at the Former Post Garbage Dump had detectable concentrations of manganese exceeding the SSSLs, ESVs, and background screening values. One sample collected from location FTA-126-SW/SD02 had iron concentrations that exceeded the SSSLs, ESVs, and background screening values. Several of the surface water samples collected had detectable concentrations of barium exceeding the ESVs; however, all analytical results were within background screening values. The barium results were flagged with a "B" data qualifier. Mercury concentrations were detected at levels exceeding the ESVs at four locations.

Volatile Organic Compounds. Three VOCs (acetone, methylene chloride, and toluene) were detected in the surface water samples collected; however, none were present at a concentration exceeding the SSSLs or ESVs.

Semivolatile Organic Compounds. Two SVOCs were detected in the surface water samples collected. The surface water samples from the Former Post Garbage Dump had detectable concentrations of phenol; however, it was not present at a concentration exceeding the SSSL or ESV. The surface water samples collected at the Former Post Garbage Dump also had detectable concentrations of bis(2-ethylhexyl)phthalate; however, it was not present at a concentration exceeding the SSSL or ESV.

No herbicides, pesticides, explosives, or PCBs were detected in any surface water samples collected.

8.3.3.5 Sediment Sampling

Five sediment samples were collected at the Fill Area East of Reilly Airfield and three samples were collected for chemical analyses at the Former Post Garbage Dump at the same locations shown in Figure 8-1. Analytical results are presented in Table 8-8.

Metals. Nineteen metals were detected in the sediment samples collected. Of the 19 metals detected, 13 exceeded background screening values in at least one sample. Only one metal (arsenic in FTA-126-SW/SD03) exceeded the SSSL, ESV, and background screening values. Five metals (arsenic, cobalt, copper, lead, and nickel) exceeded both the background screening values and ESVs in various samples. Five metals exceeded the ESVs in at least one sample.

Volatile Organic Compounds. Five VOCs were detected in the sediment samples collected. None of the detected VOC concentrations exceeded the SSSLs. Carbon disulfide and toluene were detected in two sediment samples. Four sediment samples collected had detectable concentrations of 2-butanone and all the sediment samples collected had detectable concentrations of methylene chloride; however, reported concentrations did not exceed the SSSLs or ESVs. Seven of the sediment samples collected had detectable concentrations of acetone; however, only the sample collected from location FTA-126-SW/SD03 exceeded the ESV.

Semivolatile Organic Compounds. One SVOC was detected in five sediment samples collected; however, reported concentrations did not exceed the background levels or SSSLs . SVOC concentrations in the sediment samples collected from locations FTA-126-SW/SD01, FTA-126-SW/SD02, and FTA-126-SW/SD03 exceeded the ESVs ; however, the results were flagged with a "B" data qualifier.

No herbicides, pesticides, explosives, or PCBs were detected in the sediment samples collected.

8.4 Fill Area Definition Activities

This chapter summarizes fill area definition activities conducted by IT at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump; including, trenching, soil borings, and fill material sampling and analysis.

8.4.1 Trenching Activities

Seventeen exploratory trenches were excavated at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump to characterize the horizontal and vertical extent of the fill material. Trenches were excavated to depths ranging from 10 to 15 feet bgs. Trench locations T227-1, T227-2, T227-3, T227-4, T227-5, T227-6, T227-7, and T227-9 were selected to determine the horizontal extent of the fill areas. Trench locations T227-8, T227-10, T227-11, T227-12, T227-13, T227-14, T227-15, T227-16, and T227-17 were selected to characterize the horizontal extent of the geophysical anomalies detected during surveying. Trench locations are shown in Figure 8-1. Trenching data is summarized in Table 8-9. Trench logs are included in Appendix I.

Fill material was observed in 16 of the 17 trenches, including: scrap metal, glass bottles/jars, bricks, yellow orange silt and clay, wood, wire coat hangers, metal bucket, plastic sheeting, rubber mat, glass test tubes, syringes, medical bottles, newspaper, concrete rubble, cinder blocks, battery (D-cell), steel cable, black fabric, negative film, paint cans, nails, ash, shingles, coal, light bulbs, broken plates, leather shoes, chicken wire, steel piping, rebar, crushed steel drums, and bones. No fill material was observed in trench T227-3. Glass medical bottles and syringes were observed in trenches T227-9, T227-11, T227-12, and T227-15. A rifle cartridge casing was observed in Trench T227-14. D-cell size batteries were observed in trenches T227-8 and T227-9. The trenches contained varying amounts of steel/metal material that likely caused the anomalies attributed to varying concentrations of "buried metal" in the geophysics report. The anomalies shown as “elevated conductivity” in the geophysics report correspond to the trenches containing varying amounts of disturbed clay and low amounts of metal material.

Based on the results of the exploratory trenching at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump, the horizontal extent of the Fill Area has been redefined, as shown in Figure 8-3. The estimated extent of waste fill within these parcels covers approximately 6.5 acres.

8.4.2 Fill Material Borings

Five borings were installed at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump to investigate the depth of fill material and to identify COPCs within the fill material. Fill material borings were installed to depths ranging from 10 to 18 feet bgs. A summary of boring information is presented in Table 8-10. The samples were analyzed for the parameters listed in Section 2.4. Fill material boring logs are included in Appendix C. Field procedures for the fill material borings are described in Section 2.7. Analytical results were compared to SSSLs and

background screening values as presented in Table 8-11. Sample collection logs and chain-of-custody records are provided in Appendix B.

Metals. Nineteen metals were detected in the fill material samples collected. All fill material samples had detectable concentrations of arsenic and iron exceeding the SSSLs; however, neither exceeded the background screening values. Four of the fill material samples collected had detectable concentrations of aluminum and thallium exceeding the SSSLs; however, the aluminum and thallium concentrations did not exceed the background screening values.

Volatile Organic Compounds. Four VOCs were detected in the fill material samples collected. None of the VOCs detected exceeded the SSSLs.

Semivolatile Organic Compounds. Six SVOCs were detected in the fill material sample collected from location FA-227-SB04. None of the SVOCs detected exceeded the SSSLs.

Pesticides. Four pesticides were detected in one of the fill material samples collected. None of the pesticides detected were present at a concentration exceeding the SSSLs.

Herbicides. One herbicide was detected in one fill material sample collected. The detected herbicide was not present at a concentration exceeding the SSSL.

No explosives or PCBs were detected in the fill material samples collected.

8.5 Extent of Fill Material

IT has estimated the vertical and horizontal extent of the waste fill at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump based on information gathered from the site investigation and trenching and boring activities discussed in this report. The approximate horizontal extent of fill in both parcels covers 6.5 acres, as shown in Figure 8-3. The average depth of fill material estimated from the trench and boring log data is 8 feet at the Fill Area East of Reilly Airfield and 3 feet at the Former Post Garbage Dump.

8.6 Variances

Seven variances to the work plans were recorded during the completion of the SI and fill area definition investigation at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump. The variances did not alter the intent or results of the investigations. Variances to the proposed scope of work are summarized in Table 8-12 and included in Appendix K.

9.0 Field Activities and Results for Fill Area Northwest of Reilly Airfield, Parcel 229(7)

9.1 Introduction

The Fill Area Northwest of Reilly Airfield, Parcel 229(7) is located in the northwestern corner of the Main Post (Figure 1-2). This parcel is identified as a category 7 site in the EBS and, thus, is considered an area not previously evaluated or that requires additional investigation (ESE, 1998). The original CERFA parcel boundary for the Fill Area Northwest of Reilly Airfield is shown in Figure 9-1. Site investigation and fill area definition activities were conducted at this parcel to delineate the vertical and horizontal extent of waste fill and to characterize the fill material. This section presents the results of those activities.

There are no records of disposal activities that may have occurred at the Fill Area Northwest of Reilly Airfield and, thus, the SI was conducted to determine the presence or absence of COPCs at this site. The SI included a geophysical survey, field sampling and analysis, and monitoring well installation activities. Following the SI, fill definition activities were conducted to characterize the vertical and horizontal extent of waste fill and characterize the fill material. Fill area definition activities included trenching and fill material sampling and analysis.

9.2 Site Description

The Fill Area Northwest of Reilly Airfield (Figure 1-2) contains a potential disposal area identified in the Environmental Photographic Interpretation Center (EPIC) report from the aerial photo composite dated 1954 (EPA, 1990). Linear mounds are visible in aerial photos at the northern margin of a cleared area (ground scar); however, IT did not observe these mounds during site visits on June 23, 1998 and July 21, 1998. The dense foliage and groundcover on the parcel prevented the site visit team from observing the features reported in the environmental baseline survey. Several oil filters were noted lying on the west bank of the stream. It is unclear precisely which feature or features were interpreted by EPIC as being "Fill"; therefore this original CERFA parcel encompasses the entire cleared area, including the area of the linear mounds. The size of the original CERFA parcel identified on the detail map is approximately 4.3 acres. Site elevation is approximately 740 feet above msl and ground slope is north-northeast toward Reilly Lake. IT observed various pieces of broken glass, brick, and concrete throughout the parcel.

Adjacent to the eastern boundary is an escarpment with a vertical drop of approximately 40 feet. An unnamed intermittent stream is located at the foot of the escarpment flowing north beyond the parcel and eventually into the creek that flows from Reilly Lake.

Information regarding operations at this parcel are not available. Interviews were conducted with current and retired FTMC personnel regarding past activities of the site; no one interviewed could recall disposal activities occurring at this parcel (ESE, 1998).

9.2.1 Site Geology

Soils underlying the Fill Area Northwest of Reilly Airfield are mapped as Cumberland gravelly loam, 2 percent to 6 percent slopes, eroded type soil (CoB2) (U.S. Department of Agriculture [USDA], 1961). The thickness of the soil ranges from 2 feet to 15 feet or more, and in some areas overlie beds of gravel or sand. These soils have developed in old alluvium that washed from soils derived mainly from limestone and cherty limestone, and to some extent, shale and sandstone. Rounded chert, sandstone, and quartzite gravel, as large as 3 inches in diameter, are on and in the soil.

Bedrock beneath Fill Area Northwest of Reilly Airfield, is mapped as the Cambrian Conasanga Formation throughout the site. The Cambrian Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Seven borings were installed across the site in residuum beneath the Fill Area Northwest of Reilly Airfield to collect lithologic data and characterize site geology. Borings ranged in depth from 12 feet to 44.2 feet bgs, and subsurface soils consisted primarily of red clayey silt from 3 feet to 8 feet bgs. This clayey silt overlies mottled clay with varying amounts of sand, interspersed with layers of clay, sand, and occasional gravel. A geologic map of the area, including the Fill Area Northwest of Reilly Airfield is presented in Figure 1-3.

9.2.2 Site Hydrogeology

IT installed six temporary wells at the Fill Area Northwest of Reilly Airfield at the locations shown in Figure 9-1. During boring and well installation activities, groundwater was generally encountered in clayey sand zones at depths ranging from 11 feet to 25 feet bgs.

Static groundwater elevations were measured in six temporary wells on March 13, 2000. Table 9-1 summarizes measured groundwater elevations that ranged from approximately 718 to 734

feet above msl. The March 2000 measurements were used to construct the potentiometric surface map in Figure 1-4. Groundwater flow is northeasterly at an average horizontal hydraulic gradient of approximately 0.02 ft/ft.

9.2.3 Surface Hydrology

The land surface at the Fill Area Northwest of Reilly Airfield, Parcel 229(7) is relatively flat with only a slight slope to the north and west. Surface run off appears to follow topography and generally empties into a northward-flowing, unnamed, intermittent stream located west of the parcel, which discharges into Dothard Creek.

9.3 Previous Site Characterization

The SI was conducted prior to the fill area definition investigation to characterize the source of COPCs in various site matrices, determine the nature and extent of contamination, and to provide data to evaluate the level of risk to human health and the environment posed by releases of the COPCs. The SI included field work to collect six surface soil samples, seven subsurface soil samples, six groundwater samples, three surface water samples, three sediment samples, and two depositional soil samples.

This section summarizes SI activities conducted by IT at the Fill Area Northwest of Reilly Airfield, including the geophysical survey, environmental sampling and analysis, and monitoring well installation activities. Fill area definition activities included trenching, soil borings, and fill material sampling.

9.3.1 Geophysical Survey

IT conducted a grid-based geophysical survey at the Fill Area Northwest of Reilly Airfield from January 1999 to April 1999. IT utilized the results of the geophysical survey to aid in the placement of subsurface soil sampling and trenching locations. These data were used to determine the horizontal and vertical extent of the landfill, and to characterize the geology and hydrogeology. The geophysical survey encompassed an area of approximately 409,700 square feet (9.4 acres) as shown in the geophysical interpretation map (Figure 9-2). The geophysical survey was performed as defined in Section 2.2. A detailed discussion of the geophysical investigation, including theory of operation of instruments, field procedures, data processing, and interpreted results of the investigation are presented in Appendix A.

The geophysical survey results indicate seven anomalies exist at the Fill Area Northwest of Reilly Airfield that may be caused by landfill pits, fill areas, anomalous high conductivity areas,

and low to moderate concentrations of buried metal and surface metal. The geophysical interpretation map of the site (Figure 9-2) shows the locations of geophysical anomalies and contains detailed information on permanent site reference features. The geophysical lines and other map features are tied to GPS coordinates to aid in relocating the anomalies. The anomalies shown in Figure 9-2 correspond to those shown in the magnetic and EM data contour maps presented in the geophysics report (Appendix A).

Four large anomalies are interpreted to contain low concentrations of buried metal, two landfill pits are interpreted to contain high concentrations of buried metal, and several smaller pits are interpreted to contain low or moderate concentrations of buried metal. Also shown in the geophysical site interpretation map are numerous isolated buried metallic objects/debris and areas of surface debris. One such area of primarily low concentrations of surface metal is located along a topographic slope that dips north-northeast toward a nearby creek.

Two large linear high-conductivity anomalies also are interpreted at the site oriented northwest-southeast.

9.3.2 Well Installation

Six temporary wells were installed in the residuum groundwater zone at the Fill Area Northwest of Reilly Airfield to collect groundwater samples for laboratory analysis. The well/groundwater sample locations are shown in Figure 9-1. Table 9-2 summarizes construction details of the wells installed at the Fill Area Northwest of Reilly Airfield. The well construction logs are included in Appendix C. Temporary well installation procedures are described in Section 2.6.1.

9.3.3 Environmental Sampling

The environmental sampling performed during the SI at the Fill Area Northwest of Reilly Airfield, included the collection of surface soil samples, subsurface soil samples, surface water samples, sediment samples, groundwater samples, and depositional soil samples for chemical analysis. Sample collection techniques are described in Section 2.3. Sample collection logs and chain-of-custody records are provided in Appendix B. Analytical results are compared to background screening values, residential human health SSSLs, and ESVs.

9.3.3.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from six locations and depositional soil samples were collected from two locations at the Fill Area Northwest of Reilly Airfield. Sampling locations

are shown in Figure 9-1. Surface and depositional soil samples were collected from the upper 1-foot of soil. Analytical results are presented in Table 9-3.

Metals. Twenty metals were detected in the surface and depositional soil samples collected. Surface soil samples collected from locations PPMP-229-GP01 and PPMP-229-GP05 contained all of the detected metals. Surface soil samples and depositional soil samples from locations PPMP-229-DEP01, PPMP-229-DEP02, PPMP-229-GP02, PPMP-229-GP03, PPMP-229-GP04, and PPMP-229-GP06 contained 19 of the metals detected.

The concentrations of seven metals (aluminum, chromium, iron, manganese, mercury, selenium, and vanadium) exceeded the ESVs in the samples collected; however, with the exception of manganese (detected in the depositional soil sample collected from location PPMP-229-DEP02), mercury (detected in the surface soil samples collected from locations PPMP-229-GP01 and PPMP-229-GP06), and selenium (detected in the surface soil samples collected from locations PPMP-229-GP03, PPMP-229-GP04, and PPMP-229-GP06), the concentrations of these metals are within the background screening values. Manganese detected in the sample collected from location PPMP-229-DEP02 was present at a concentration exceeding the background screening value, ESV, and SSSL.

Volatile Organic Compounds. Sixteen VOCs were detected in the surface and depositional soil samples collected. None of the VOC detected exceeded the SSSLs. The surface soil sample collected from location PPMP-229-GP01 had detectable concentrations of 1,2-dimethylbenzene, ethylbenzene, and m,p-xylenes exceeding the ESVs.

Pesticides. Four pesticides were detected in four of the surface soil samples collected. Pesticides were not detected in the two depositional soil samples or the remaining surface soil samples collected. None of the pesticides detected were present at a concentration exceeding the SSSLs or ESVs.

No SVOC, herbicides, explosives, or PCBs were detected in the surface and depositional soil samples collected.

9.3.3.2 Subsurface Soil Sampling

Subsurface soil samples were collected from seven soil borings. Subsurface soil samples were collected from various intervals at depths ranging from 2 to 12 feet bgs. Sample locations are shown in Figure 9-1. Analytical results are presented in Table 9-4.

Metals. Twenty metals were detected in the subsurface soil samples collected. The concentrations of seven metals (aluminum, arsenic, chromium, iron, manganese, thallium, and vanadium) exceeded the SSSLs; however, all the concentrations of these metals were within background screening values.

Selenium exceeded background screening values at all sample locations except for PPMP-229-GP01. Mercury exceeded background screening values at PPMP-229-GP02 and PPMP-229-GP05; however, both concentrations were below the SSSLs.

Volatile Organic Compounds. Twelve VOCs were detected in the subsurface soil samples collected. None of the VOCs detected exceeded the SSSLs.

Semivolatile Organic Compounds. Ten SVOCs were detected in only one subsurface soil sample collected. SVOCs were not detected at the remaining six subsurface soil sample locations. The subsurface soil sample collected from location PPMP-229-GP05 had a detectable concentration of benzo(a)pyrene exceeding the SSSL.

Pesticides. Two pesticides were detected in two of the subsurface soil samples collected. Pesticides were not detected at the remaining five sample locations. None of the detected pesticides were present at a concentration exceeding the SSSLs.

No herbicides, explosives, or PCBs were detected in the subsurface soil samples collected.

9.3.3.3 Groundwater Sampling

Groundwater was sampled from the six temporary wells at the Fill Area Northwest of Reilly Airfield. Well/groundwater sampling locations are shown in Figure 9-1. Analytical results are presented in Table 9-5. Groundwater field parameters are presented in Table 9-6.

Metals. Seventeen metals were detected in the groundwater samples collected. The concentrations of five metals (aluminum, barium, iron, manganese, and vanadium) exceeded both the SSSLs and background screening values. Chromium (detected in the sample collected from location PPMP-229-GP02) was detected at a level exceeding the SSSL but was within the background screening value. Calcium, Potassium, and Sodium was detected at a concentration exceeding the background screening value but was within the SSSL screening value.

Metals exceeding the background screening values and the SSSLs in groundwater samples collected from PPMP-229-GP02 are attributed to the high turbidity (greater than 100 NTU) of the sample (Table 9-6).

Volatile Organic Compounds. Sixteen VOCs were detected in the groundwater samples collected. Thirteen of the 16 VOCs were detected in the groundwater sample collected from location PPMP-229-GP01. Naphthalene and 1,4-dichlorobenzene were present at concentrations that exceeded the SSSLs. The remaining five sample locations contained six or less of the VOCs detected. Vinyl chloride was present at a concentration exceeding the SSSL in the sample collected from PPMP-229-GP07.

Three VOCs (1,4-dichlorobenzene, naphthalene, and vinyl chloride) were detected at concentrations exceeding the SSSLs. As discussed in Section 2.4, 1,4-dichlorobenzene and naphthalene that are common to the reported lists of VOCs and SVOCs.

Semivolatile Organic Compounds. Seven SVOCs were detected in the groundwater samples collected. SVOCs were not detected in two groundwater samples. The groundwater samples collected from locations PPMP-229-GP02 and PPMP-229-GP07 had detectable concentrations of one SVOC. The groundwater samples collected from locations PPMP-229-GP01 and PPMP-229-GP05 had detectable concentrations of three SVOCs. None of these samples had concentrations exceeding the background or SSSL screening values. The groundwater sample collected from location PPMP-229-GP01 had detectable concentrations of 1,4-dichlorobenzene and naphthalene exceeding the SSSLs.

Pesticides. One pesticide was detected in the groundwater sample collected from location PPMP-229-GP07. Pesticides were not detected at the remaining five groundwater sample locations. The pesticide detected was not present at a concentration exceeding the SSSLs.

Explosives. One explosive was detected in two groundwater samples collected from locations PPMP-229-GP01 and PPMP-229-GP05. Explosives were not detected in the remaining four groundwater samples collected. The concentration of RDX exceeded the SSSLs in the samples collected from the two locations.

No herbicides or PCBs were detected in the groundwater samples collected.

9.3.3.4 Surface Water Sampling

Three surface water samples were collected at the Fill Area Northwest of Reilly Airfield. Two surface water samples were collected from the stream located east of the site at sample locations shown in Figure 9-1. One surface water sample was collected from the deep drainage feature southwest of the fill area. Field parameter measurements are provided in Table 9-6. Analytical results are presented in Table 9-7.

Metals. Ten metals were detected in all three surface water samples collected. None of the detected metal concentrations exceeded the SSSLs. The concentration of five metals (aluminum, barium, iron, manganese, and mercury) detected in the three surface water samples exceeded the ESVs but were within background screening values.

No herbicides, pesticides, explosives, PCBs, SVOCs, or VOCs were detected in the surface water samples collected.

9.3.3.5 Sediment Sampling

Three sediment samples were collected for chemical analysis at the Fill Area Northwest of Reilly Airfield at the same locations as the surface water samples presented in Section 9.3.3.4 (Figure 9-1). Analytical results are presented in Table 9-8.

Metals. Twenty metals were detected in the sediment samples collected. The sediment samples collected from location PPMP-229-SW/SD01 had detectable concentrations of all 20 of the metals detected. The sediment sample collected from location PPMP-229-SW/SD02 had detectable concentrations of 19 of the 20 metals detected and the sample collected from location PPMP-229-SW/SD03 had detectable concentrations of 17 of the 20 metals detected.

None of the metals detected in the sediment sample collected from location PPMP-229-SW/SD03 were present at a concentration exceeding background screening values, SSSLs, or ESVs. None of the metals detected in the sediment samples collected from locations PPMP-229-SW/SD01 or PPMP-229-SW/SD02 were present at a concentration exceeding the SSSLs. Cadmium, cobalt, copper, and nickel concentrations detected in the sediment sample collected from location PPMP-229-SW/SD01 and the nickel concentration detected in the sediment sample collected from location PPMP-229-SW/SD02 exceeded the background screening values and the ESVs. The lead concentration detected in the sediment sample collected from location PPMP-229-SW/SD01 exceeded the ESV but was within the background screening value.

Volatile Organic Compounds. Two VOCs were detected in the sediment samples collected. None of the detected VOC concentrations exceeded the

Semivolatile Organic Compounds. One SVOC was detected in two of the sediment samples collected from locations PPMP-229-SW/SD01 and PPMP-229-SW/SD02. The detected SVOC concentration did not exceed the SSSL or ESV. SVOCs were not detected in the remaining sediment sample collected.
SSSLs or ESVs.

No herbicides, pesticides, explosives, or PCBs were detected in the sediment samples collected.

9.4 Fill Area Definition Activities

This chapter summarizes fill area definition activities conducted by IT at the Fill Area Northwest of Reilly Airfield. Fill area definition activities included trenching, soil borings, and fill material sampling and analysis. IT collected fill material samples in March 2000 at this site to determine the horizontal and vertical extent of the fill area and characterize the waste fill material.

9.4.1 Trenching Activities

Thirteen exploratory trenches were excavated at the Fill Area Northwest of Reilly Airfield to characterize and determine the horizontal and vertical extent of the fill material. Trenches were excavated to depths ranging from 6 to 15 feet bgs. Trenches T229-1 and T229-3 were combined into one large trench because of the proximity of the two trenches. Trench locations T229-1, T229-3, T229-4, T229-6, T229-7, T229-11, T229-12, and T229-13 were placed to characterize the geophysical anomalies. Trench locations T229-2, T229-5, T229-8, T229-9, and T229-10 were used to characterize the horizontal extent of the Fill Area. Trench locations are shown in Figure 9-1. Trenching data are summarized in Table 9-9. Trenching procedures are described in Section 2.8. Trenching logs are provided in Appendix I.

Fill material observed in the 13 trenches included scrap metal, glass bottles, bricks, yellow orange silt and clay, wood, ash, coal, tires, light bulbs, aluminum car body trim, broken plates, leather shoes, newspaper, steel piping, rebar, door parts, crushed steel drums, medical bottles and tubing, and bones. Glass medical bottles were observed in Trench T229-7, T229-10, and T229-13; and syringes were observed in Trench T229-7. Eighteen practice hand grenades and 7 test tubes were observed in Trench T229-9. Intravenous medical tubing was observed in Trench T229-12. During trenching at T229-13, a practice A57 armor piercing round was encountered. FTMC Transition Force personnel confirmed that it was an inert practice round. All the trenches

contained varying amounts of steel/metal material, which correspond to the varying concentrations of 'buried metal" anomalies shown in the geophysics report. The anomalies shown as "elevated conductivity" on the geophysical report correspond to the trenches containing varying amounts of disturbed clay and low amounts of metal material.

Based on the results of the exploratory trenching at the Fill Area Northwest of Reilly Airfield, the horizontal extent of the Fill Area has been redefined as shown in Figure 9-3. The area of fill covers approximately 5.87 acres.

9.4.2 Fill Material Borings

Two borings were installed to depths of 10 and 12 feet bgs at the Fill Area Northwest of Reilly Airfield and two fill material samples were collected for chemical analysis at the sample locations shown in Figure 9-1. Fill material data is summarized in Table 9-10. Fill material boring logs are included in Appendix C, and include detailed characterization of the fill material. Fill material boring procedures are described in Section 2.7. Sample collection logs and chain-of-custody records are provided in Appendix B. Analytical results were compared to SSSLs and background screening values, as presented in Table 9-11.

Metals. Twenty-two metals were detected in the fill material samples collected. The fill material sample collected from location FA-229-SB01 contained all the detected metals and the fill material sample collected from location FA-229-SB02 contained 18 of the 22 metals detected.

The concentrations of six metals (aluminum, arsenic, chromium, iron, thallium, and vanadium) exceeded the SSSLs; however, with the exceptions of aluminum, chromium, iron, and vanadium detected in the fill material sample collected from location FA-229-SB02, the concentrations of these metals were within background screening values.

Volatile Organic Compounds. Three VOCs were detected in the fill material samples collected. None of the VOCs detected were present at a concentration exceeding the SSSLs.

Semivolatile Organic Compounds. Ten SVOCs were detected in the fill material samples collected. None of the SVOCs detected were present at a concentration exceeding the SSSLs. The fill material sample collected from location FA-229-SB02 contained only one of the ten SVOCs detected. The fill material sample collected from location FA-229-SB01 contained all ten of the SVOCs detected.

Pesticides. Three pesticides were detected in the fill material sample collected from location FA-229-SB01. Pesticides were not detected at the remaining fill material sample location. None of the detected pesticides were present at a concentration exceeding the SSSLs.

Herbicides. One herbicide was detected in the fill material sample collected from location FA-229-SB01. Herbicides were not detected at the remaining fill material sample location. The detected herbicide was not present at a concentration exceeding the SSSL.

No explosives or PCBs were detected in the fill material samples collected.

9.5 Extent of Fill Material

IT has estimated the vertical and horizontal extent of fill material at the Fill Area Northwest of Reilly Airfield based on information gathered from previous site investigations and trenching and boring activities discussed in this report. The fill area covers approximately 5.87 acres, as shown in Figure 9-3. The average depth of fill material estimated from the trench and boring log data is approximately 8 feet bgs.

9.6 Variances

One variance to the fill area definition work plan was recorded during the completion of the fill area definition investigation at the Fill Area Northwest of Reilly Airfield. The variance did not alter the intent or results of the investigation. The variance is summarized in Table 9-12 and included in Appendix K.

10.0 Field Activities and Results for Fill Area at Range 30, Parcel 231(7)

10.1 Introduction

The Fill Area at Range 30, Parcel 231(7) is located in the north-central portion of the Main Post (Figure 1-2). This parcel is identified as a category 7 site in the EBS and, thus, is considered an area not previously evaluated or that requires additional investigation (ESE, 1998). The original CERFA parcel boundary for the Fill Area North at Range 30 is shown in Figure 10-1. Site investigation and fill area definition activities were conducted at this parcel to delineate the vertical and horizontal extent of waste fill and to characterize the fill material. This section presents the results of those activities.

The Fill Area at Range 30 falls within a "Possible Explosive Ordnance Impact Area" shown on Plate 10 of the FTMC Archive Search Report, Maps (USACE, 1999b) and, thus, the UXO avoidance procedures described in Section 2.1 were implemented at this parcel.

There are no records of disposal activities that may have occurred at the Fill Area at Range 30 and, thus, the SI was conducted to determine the presence or absence of COPCs at this site. The SI included field sampling and analysis, and monitoring well installation activities. Following the SI, fill area definition activities were conducted to characterize the vertical and horizontal extent of the waste fill and characterize the fill material. Because the fill material appears to have been deposited as mounds and no burial is anticipated, geophysical investigations were not performed. Fill area definition activities included trenching and fill material sampling and analysis. The trenching work was conducted to evaluate several areas, with no significant findings. Because the records search did not disclose trenching or other disposal activities for the site and the site was covered with observable mounds of construction debris/dirt from dump truck unloading, there was no justification for using surface geophysics to delineate the waste.

10.2 Site Description

The Fill Area at Range 30 is near the eastern end of Reilly Airfield (Figure 1-2). The parcel fronts an unnamed paved road east of the northern end of 10th Street near Reilly Airfield and lies between two unimproved dirt roads. The estimated original CERFA parcel boundary is shown in Figure 10-1. The size of the parcel could not be determined from the EPIC report (EPA, 1990); however, it was estimated to be about 6 acres.

Range 30 covers about 23 acres (EPA, 1990). The dates of operation for Range 30 could not be determined; however, it is visible on 1949, 1954, 1961, 1972, and 1982 aerial photographs. On the basis of interviews conducted with Main Post personnel, it appears the Range was deactivated between 1983 and 1989. Documentation or records of fill areas or disposal practices at Range 30 were not available. Photographic signatures, resembling large linear north-south trending mounds, are present in the central portion of this parcel. Also, smaller mounds are present at other locations within the parcel. Several piles of construction debris are present along both sides of an unimproved road that traverses the southern portion of the site. IT could not verify that the mounds of construction debris along the unimproved road were the mounds identified in the EPIC report photographs because of the dense vegetation.

The northern acreage of Range 30 (approximately 10 acres) has been plowed and seeded as a feed area for wild animals and is posted as such. This area is not part of the focus for the SI or the EE/CA conducted by IT (Figure 10-1). During a June 1998 site visit, IT observed a rectangular body of water (seep) near the southern part of the site and an unmarked well located near the unnamed paved road in the northern part of the site. An intermittent stream (dry at the time of the IT site visit) has its origins on the slope southeast of the parcel and flows to the north along the eastern boundary and crosses underneath the paved road at the northernmost point of the parcel. The far southern portion of the site is graded soil without any grass or shrubs. The unimproved road that crosses the southern portion of the site is covered during wet periods by a shallow pond, approximately 20 by 20 feet.

10.2.1 Site Geology

The entire area is covered with the Cumberland gravelly loam, 2 to 6 percent slopes, eroded type soil (CoB2). The surface soil ranges from very dark brown to reddish brown. The subsoil ranges from dark red to red and from silty clay loam to clay in texture. The thickness of the soil ranges from 2 feet to 15 feet or more. In some areas, this soil is underlain by beds of gravel or sand. Infiltration is medium, permeability is moderate, and the capacity for available moisture is high. Runoff is medium and is a slight hazard. These soils have developed in old alluvium that washed from soils derived mainly from limestone and cherty limestone, and to some extent, shale and sandstone. Rounded chert, sandstone, and quartzite gravel, as much as 3 inches in diameter are on and in the soil (USDA, 1961). Elevations across the site range from approximately 750 to 760 feet above msl.

Bedrock beneath the Fill Area at Range 30 has been mapped as Cambrian Conasauga Formation. This formation is composed of dark-gray, finely to coarsely crystalline medium- to thick-bedded

dolomite with minor shale and chert (Osborne et al, 1989). A geologic map of the area, including the Fill Area at Range 30 is presented in Figure 1-3.

10.2.2 Site Hydrogeology

IT installed four temporary monitoring wells in residuum at the Fill Area at Range 30. During boring and well installation activities, groundwater was generally encountered in clayey sand zones at depths ranging from 28 feet to 37 feet bgs. Table 10-1 summarizes measured groundwater elevations at the Fill Area at Range 30. Static groundwater elevations were measured in the temporary wells on March 13, 2000. The potentiometric surface map constructed from the March 2000 data is shown in Figure 1-4. Groundwater flow at the site is to the west-northwest with an average horizontal hydraulic gradient ranging from approximately 0.02 to 0.03 ft/ft.

10.2.3 Surface Hydrology

There are no streams near the fill area at Range 30, Parcel 231(7), however, surface water flow across the site appears to follow site topography to the north-northwest. A shallow water-filled depression was noted during several site visits on the southwestern portion of the site and is suspected to be spring-fed. A surface drainage trench has been cut west of the fill area to direct surface water flow to the northwest and west.

10.3 Site Investigation

Eleven soil borings and four temporary groundwater monitoring wells were installed as part of the SI conducted by IT at the Fill Area at Range 30. Boring locations are shown in Figure 10-1. Based on the SI soil boring locations, boring PPMP-231-GP01 appears to have been the only boring drilled in fill material. This boring was subsequently abandoned and offset approximately 60 feet west to install a temporary groundwater monitoring well.

The boring log for PPMP-231-GP01 indicates plastic sheeting was found in the split spoon sampler at approximately 19 feet to 40 feet bgs. Based on the depth of plastic encountered, it is believed that the plastic sheeting was dragged down from an upper horizon to a deeper depth by the hollow stem auger. The actual depth of plastic encountered at location PPMP-231-GP01 is not known. Fill material was not observed in any other boring installed during the SI at the Fill Area at Range 30.

10.3.1 Well Installation

The locations of the four temporary wells installed by IT are shown in Figure 10-1. Table 10-2 summarizes well construction details. The well construction diagrams are included in Appendix C. Temporary well installation procedures are described in further detail in Section 2.6.1.

10.3.2 Environmental Sampling

The environmental sampling performed during the SI included the collection of surface soil samples, subsurface soil samples, surface water samples, sediment samples, seep water samples, groundwater samples, and depositional soil samples for chemical analysis. Sample collection techniques are described in further detail in Section 2.3. Sample collection logs and chain-of-custody records are provided in Appendix B. Analytical results were compared to the residential human health SSSLs, background screening values, and ESVs.

10.3.2.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from eleven locations and depositional soil samples were collected for chemical analysis from three locations at the Fill Area at Range 30. Sampling locations are shown in Figure 10-1. Surface and depositional soil samples were collected from the upper 1-foot of soil. Analytical results are presented in Table 10-3.

Metals. Twenty-two metals were detected in the surface and depositional soil samples collected. Fourteen exceeded background screening values in various samples. Of those, three metals (arsenic, iron, and vanadium) also exceeded the SSSLs and ESVs in the surface soil sample collected from location PPMP-231-GP01. Three of the metals (lead, mercury, and selenium) exceeded the ESVs but not the SSSLs.

Volatile Organic Compounds. Seven VOCs were detected in the surface and depositional soil samples collected. None of the detected VOCs exceeded the SSSLs or the ESVs.

Semivolatile Organic Compounds. Sixteen SVOCs were detected in the surface and depositional soil samples collected. Fifteen SVOCs were present in the sample collected from location PPMP-231-GP08. The surface soil sample collected from location PPMP-231-GP08 had detectable concentrations of benzo(a)pyrene which exceeded both the SSSLs and ESVs. The same sample collected from location PPMP-231-GP08 had detectable concentrations of anthracene, fluoranthene, and pyrene that exceeded the ESVs. No other samples contained SVOCs at concentrations exceeding the SSSLs or ESVs.

Pesticides. Six pesticides were detected in the surface soil samples collected. Pesticides 4,4'-DDE and 4,4'-DDT were detected above the ESVs in the surface soil samples collected from location PPMP-231-GP02 and PPMP-231-GP08. The surface soil sample collected from location PPMP-231-GP08 also had a detectable concentration of endrin ketone and delta-BCH; however, the reported concentrations did not exceed the SSSLs or ESVs. The surface soil sample collected from location PPMP-231-GP07 also had a detectable concentration of aldrin and endosulfan sulfate. Pesticides were not detected in seven of the surface soil samples collected or in the three depositional soil samples collected.

No herbicides, explosives, or PCBs were detected in the surface and depositional soil samples collected.

10.3.2.2 Subsurface Soil Sampling

Subsurface soil samples were collected for chemical analysis from eleven locations at the Fill Area at Range 30. Subsurface soil samples were collected from various intervals at depths ranging from 4 to 12 feet bgs. Sampling locations are shown in Figure 10-1. Analytical results are presented in Table 10-4.

Metals. Twenty-two metals were detected in the subsurface soil samples collected. The concentrations of arsenic and iron exceeded the SSSLs in all samples collected; however, none of these concentrations exceeded the background screening values (Table 10-4).

Selenium exceeded the background screening values in ten of the samples collected; however, none of these concentrations exceeded the SSSLs.

Volatile Organic Compounds. Four VOCs were detected in the subsurface soil samples collected; however, none of the detected VOCs exceeded the SSSLs.

Semivolatile Organic Compounds. Two SVOCs were detected in the subsurface soil samples collected. None of the SVOCs detected exceeded the SSSLs.

Pesticides. One pesticide was detected in the subsurface soil sample collected from location PPMP-231-GP02; however, the result was below the SSSL.

No herbicides, explosives, or PCBs were detected in the subsurface soil samples collected.

10.3.2.3 Groundwater Sampling

Groundwater was sampled from the four temporary wells (PPMP-231-GP01, PPMP-231-GP02, PPMP-231-GP03, and PPMP-231-GP11) at the Fill Area at Range 30. Well/groundwater sampling locations are shown in Figure 10-1. Samples were analyzed for the parameters listed in Section 2.4. Analytical results are presented in Table 10-5. Field parameter measurements are provided in Table 10-6.

Metals. Nineteen metals were detected in the groundwater samples collected. The sample collected from location PPMP-231-GP01 had detectable concentrations of aluminum, arsenic, iron, lead, manganese, thallium, and vanadium exceeding both the background screening values and the SSSLs. The thallium result was flagged with a "B" data qualifier signifying that the compound was also detected in an associated laboratory or field blank. The groundwater sample collected from location PPMP-231-GP01 also had detectable concentrations of barium, chromium, and nickel exceeding the SSSLs. In addition, beryllium, cobalt, and copper were detected at concentrations above background screening values, but below the SSSLs.

Metals exceeding the SSSLs and background screening values in the groundwater sample collected from PPMP-231-GP01 are attributed to the high turbidity (greater than 100 NTU) of the sample (Table 10-6).

Volatile Organic Compounds. Three VOCs were detected in the groundwater samples collected. None of the VOCs detected exceeded the SSSLs.

Semivolatile Organic Compounds. Only one SVOC (bis[2-ethylhexyl]phthalate) was detected in the groundwater samples collected. The reported concentration did not exceed the SSSL.

No herbicides, pesticides, explosives, or PCBs were detected in the groundwater samples collected.

10.3.2.4 Surface Water Sampling

One surface water sample was collected for chemical analysis at the Fill Area at Range 30. The sample location is presented in Figure 10-1. Field parameter measurements are provided in Table 10-6. Analytical results are presented in Table 10-7.

Metals. Seven metals were detected in the surface water sample collected. The surface water sample collected from location PPMP-231-SW/SD01 had detectable concentrations of aluminum and barium exceeding the ESVs. No other metals exceeded background screening values, SSSLs, or ESVs.

Volatile Organic Compounds. One VOC (acetone) was detected in the surface water sample collected from location PPMP-231-SW/SD01. The reported concentration did not exceed the SSSL or ESV.

No herbicides, pesticides, explosives, PCBs, or SVOCs were detected in the surface water sample collected.

10.3.2.5 Sediment Sampling

One sediment sample was collected for chemical analysis at the Fill Area at Range 30. Sampling locations are presented in Figure 10-1. Analytical results are presented in Table 10-8.

Metals. Seventeen metals were detected in the sediment sample collected; however, none of the metals exceeded the SSSLs, ESVs, or background screening values.

Volatile Organic Compounds. One VOC was detected in the sediment sample collected; however, the analytical result did not exceed the SSSL or ESV.

No herbicides, pesticides, explosives, PCBs, or SVOCs were detected in the sediment sample collected.

10.3.2.6 Seep Sampling

One seep sample was collected for chemical analysis at the fill area at Range 30 at the sample location shown in Figure 10-1. Field parameter measurements are provided in Table 10-6. Analytical results are presented in Table 10-9.

Metals. Nine metals were detected in the seep sample collected. The seep sample collected from location PPMP-231-SEP01 had detectable concentrations of barium exceeding the ESV and the background screening value.

Semivolatile Organic Compounds. One SVOC (bis[2-ethylhexyl]phthalate) was detected in the seep sample collected from location PPMP-231-SEP01 at a concentration exceeding the ESV; however, that analytical result was flagged with a "B" data qualifier.

No herbicides, pesticides, explosives, PCBs, or VOCs were detected in the seep sample collected.

10.4 Fill Area Definition Activities

This chapter summarizes fill area definition activities conducted by IT at the Fill Area at Range 30, including trenching, soil borings, and fill material sampling and analysis. IT installed two fill material borings and collected fill samples at locations FA-231-SB01 and FA-231-SB02 in March 2000 to characterize the waste fill.

10.4.1 Trenching Activities

Six exploratory trenches were excavated at the Fill Area at Range 30. Trenches were excavated at depths ranging from 2.5 to 8 feet bgs. Trench location T231-1 was placed to characterize the southeastern horizontal extent of the fill area and the mounds located in this area. Trench T231-2 was placed to characterize the northeastern horizontal extent of the fill area at this location. Trench T231-3 was placed to characterize the northern horizontal extent of the fill area and the mounds at this location. Trench T231-4 was placed to characterize the western horizontal extent of the fill area and the mounds at this location. Trenches T231-5 and T231-6 were placed to characterize mounds located in the western section of the fill area. Trench locations are shown in Figure 10-1. Trench data is summarized in Table 10-10. Trenching procedures are described in Section 2.8. Trenching logs are provided in Appendix I.

Fill material was not observed in trench T231-3. Fill material was observed in all of the other trenches and included: metal pipes and straps, glass, red bricks, reddish-orange sand and silt, light brown silt, cobbles, black coal, orange/red sand and clay, plastic chip bag, plastic sheeting, beer cans, styrofoam, plastic "Texaco" oil containers, corrugated pipe, concrete chunks, ceramic pieces, tree limbs, leaves, pine needles, carpet, and plastic trash bags.

Based on the results of the exploratory trenching at the Fill Area at Range 30, the horizontal extent of the fill area has been defined as shown in Figure 10-2 and covers approximately 3.9 acres.

10.4.2 Fill Material Borings

Two borings were installed at the Fill Area at Range 30. Fill material boring were installed to a depth of 6 feet bgs. The fill material boring logs are included in Appendix C, and provide detailed characterization of the fill material at these locations. Fill material boring procedures are described in Section 2.7. Fill material boring information is summarized in Table 10-11. One subsurface soil/fill material samples was collected from each boring and analyzed for the parameters listed in Section 2.4. Sample collection logs and chain-of-custody records are provided in Appendix B. Analytical results were compared to the SSSLs and background screening values, as presented in Table 10-12.

Metals. Eighteen metals were detected in the fill material samples collected. Aluminum, arsenic, iron, and thallium exceeded the SSSLs in both samples. Manganese exceeded the SSSL in the fill material sample collected from location FA-231-SB02. Calcium, copper, magnesium, and zinc concentrations exceeded background screening values at both sample locations. Lead and nickel concentrations present in the fill material sample collected from location FA-231-SB02 exceeded the background screening values.

Volatile Organic Compounds. Two VOCs were detected in the fill material samples collected; however, none of the VOCs detected exceeded the SSSLs.

Semivolatile Organic Compounds. One SVOC was detected in both of the fill material samples collected; however, the SVOC was not detected at a concentration exceeding the SSSL.

Pesticides. Two pesticides were detected in both of the fill material samples collected from locations FA-231-SB01 and FA-231-SB02. None of the pesticides detected were present at concentrations exceeding the SSSLs.

No herbicides, explosives, or PCBs were detected in the fill material samples collected.

10.5 Extent of Fill Material

IT has estimated the vertical and horizontal extent of fill material at the Fill Area at Range 30 based on information gathered from previous site investigations and trenching and boring activities discussed in this report. The fill area covers approximately 3.9 acres, as shown in Figure 10-2. The average depth of fill material estimated from the trench and boring log data is approximately 4 feet bgs.

10.6 Variances

Five variances to the work plans were recorded during the completion of the SI and fill area definition investigation at the Fill Area at Range 30. The variances did not alter the intent or results of the investigations. Variances to the work plan are summarized in Table 10-13 and are included in Appendix K.

11.0 Field Activities and Results for the Fill Area West of Iron Mountain Road and Range 19, Parcel 233(7)

11.1 Introduction

The Fill Area West of Iron Mountain Road and Range 19, Parcel 233(7) is located in the west-central portion of the Main Post (Figure 1-2). This parcel is identified as a category 7 site in the EBS and, thus, is considered an area not previously evaluated or that requires additional investigation (ESE, 1998). The original CERFA parcel boundary for the Fill Area West of Iron Mountain Road and Range 19 is shown in Figure 11-1. Site investigation and fill area definition activities were conducted at this parcel to delineate the vertical and horizontal extent of waste fill and to characterize the fill material. This section presents the results of those activities.

The Fill Area West of Iron Mountain Road and Range 19 falls within a "Possible Explosive Ordnance Impact Area" shown on Plate 10 of the FTMC Archive Search Report, Maps (USACE, 1999b) and, thus, the UXO avoidance procedures described in Section 2.1 were implemented at this parcel.

There are no records of disposal activities that may have occurred at the Fill Area West of Iron Mountain Road and Range 19 and, thus, the SI was conducted to determine the presence or absence of COPCs at this site. The SI included a geophysical survey, field sampling and analysis, and monitoring well installation activities. Following the SI, fill area definition activities were conducted to characterize the vertical and horizontal extent of the waste fill and characterize the fill material. Fill area definition activities included trenching and fill material sampling and analysis.

11.2 Site Description

The Fill Area West of Iron Mountain Road and Range 19 is located approximately 550 feet west of Iron Mountain Road and immediately southwest of an unnamed asphalt road (Figure 1-2). The parcel covers approximately just over 1 acre, although the boundaries of the parcel are not clearly defined. The parcel was identified from a 1949 aerial photo composite in the EPIC report (EPA, 1990). Information is not available regarding the type of material placed at this location.

Historically, the area in the vicinity of this parcel is identified as the Combat Range No. 2 and Rocket Range in the FTMC Archive Search Report, Maps (USACE, 1999b). The Combat Range No. 2 was reportedly built during the Inter-War period and initial use is unknown. During World War II, the Combat Range No. 2 area was divided into other uses including a rocket range, a

machine gun range, and two rifle grenade ranges. By 1958, all ranges in this area were closed or abandoned.

The Rocket Range was used during World War II and was part of Combat Range No. 2. It is stated in the FTMC Archive Search Report that during a site visit, 2.36-inch rockets (bazooka) were found on the rocket range near Area 17 (USACE, 1999b). Additionally, it is stated in the FTMC Archive Search Report that 3.5-inch rockets may have been used on this range (USACE, 1999b).

Based upon field observations, the width of the parcel is about 160 feet (east to west), and approximately 350 feet long (north to south), approximately 1.3 acres (Figure 11-1). The site slopes downhill to the north. Vegetation across the parcel varies. The northern area of the parcel is thickly populated with large pine trees. In other areas of the parcel, vegetation is sparse. In the southern portion of the parcel, rocks, metal debris, dirt mounds, and partially exposed drums at the surface were observed. There is a tributary of Remount Creek approximately 220 feet northwest of the Fill Area that flows in a northeasterly direction.

During the site visit by IT (June 1998), the tributary was observed to be dry. Shallow groundwater at the site is probably controlled by surface drainage and topography and flow is likely to the northeast. Site elevation ranges from 820 feet to 835 feet NGVD. An abandoned wooden storage facility adjacent to an old coal bunker is located approximately 250 feet north of the parcel. An abandoned military jeep is located to the southeast of the abandoned wooden storage facility.

From review of previous reports, the dates during which the Fill Area West Iron Mountain Road and Range 19 was used could not be determined. In addition, information is not available on the material stored or the previous use of this parcel.

11.2.1 Site Geology

The soil type at the Fill Area is Anniston and Allen gravelly clay loam, which is a severely eroded soil with poor infiltration and moisture capacity. These soils are formed either by erosional forces, surface runoff, or natural reworking processes. Colors are typically reddish-brown. The high erosion hazard, low capacity for available moisture, and thin root zone make this poorly suited for cultivation (USDA, 1961).

Bedrock beneath the Fill Area West Iron Mountain Road and Range 19 has been mapped as Ordovician Little Oak and Newala Limestones. A geologic map of the area, including the Fill Area West of Iron Mountain Road and Range 19 is presented in Figure 1-3.

11.2.2 Site Hydrogeology

IT installed four permanent monitoring wells at the site in February and March 2000. Groundwater was encountered during drilling at depths ranging from 55 to 68 feet bgs. Static groundwater was measured at 69.9 feet below top of casing in well PPMP-233-GP04 on July 14, 2000. As shown on Figure 11-1, PPMP-233-GP04 is located on the northwest corner of the site. The three other site wells were reported dry during this sampling event and all subsequent periods. Water level measurement procedures are described in Section 2.6.3. Table 11-1 summarizes measured groundwater elevations at the Fill Area West of Iron Mountain Road and Range 19. Groundwater elevation data is currently insufficient to determine the local groundwater flow gradient and direction; however, based on topography and local drainage, the shallow groundwater likely flows to the north-northeast (Figure 1-4).

11.2.3 Surface Hydrology

During previous site visits, surface water was not observed at the Fill Area West of Iron Mountain Road and Range 19, Parcel 233(7). However, based on site topography surface water is expected to flow to the east-northeast into an intermittent surface water drainage feature. Surface water from the site eventually discharges into a man made ditch on the west side of Iron Mountain Road, and eventually into Remount Creek on the east site of Iron Mountain Road.

11.3 Site Investigation

The SI was conducted prior to the fill area definition investigation to characterize the source of COPCs in various site matrices, determine the nature and extent of contamination, and to provide data to evaluate the level of risk to human health and the environment posed by releases of the COPCs.

This section summarizes SI activities conducted by IT, including a geophysical survey, well installations, and environmental sampling and analysis.

11.3.1 Geophysical Survey

IT conducted a grid-based geophysical survey at the Fill Area West of Iron Mountain Road and Range 19 on January 29, 2000. IT utilized the results of the geophysical survey to aid in the placement of trench locations. These data were used to determine the horizontal and vertical

extent of the landfill, and to characterize the geology and hydrogeology. The survey area encompassed approximately 85,600 square feet (1.97 acres) and is shown in the geophysical interpretation map (Figure 11-2). The geophysical survey was performed as defined in Section 2.2. A detailed discussion of the geophysical investigation, including theory of operation of instruments, field procedures, data processing, and interpreted results of the investigation are presented in Appendix A.

One area of anomalously high conductivity readings occurs in the northeastern portion of the site. Nearby metallic debris is absent and the exact cause of the elevated conductivity readings is uncertain. Possible anomaly sources include: 1) surface disposal or placement of conductive fill materials, 2) a local increase in the volume of fine-grained sands at the surface associated with construction activities and 3) an old road bed that is partially covered with soil. The interpretation map also shows the locations of individual surface metal objects and areas of low to moderate concentrations of surface metal.

11.3.2 Well Installation

Four permanent groundwater monitoring wells were installed at the Fill Area West of Iron Mountain Road and Range 19. The well locations are shown in Figure 11-1. Table 11-2 summarizes construction details of the wells installed. Boring logs and well construction diagrams are provided in Appendix C. Permanent well installation procedures are described in further detail in Section 2.6.2.

11.3.3 Environmental Sampling

The environmental sampling performed during the SI was conducted in February, June, and July 2000 and included the collection of surface and depositional soil samples, subsurface soil samples, and a groundwater sample for chemical analysis. Sample collection techniques are described in Section 2.3. Sample collection logs and chain-of-custody records are provided in Appendix B. Analytical results were compared to the residential human health SSSLs, background screening values, and ESVs, as presented in Tables 11-3, 11-4, and 11-5.

11.3.3.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from six locations and depositional soil samples were collected from one location for chemical analysis at the Fill Area West of Iron Mountain Road and Range 19. Sampling locations are shown in Figure 11-1. Surface and depositional samples were collected from the upper 1-foot of soil at the site. Analytical results are presented in Table11-3.

Metals. Six metals were detected in the surface and depositional soil samples collected. Concentrations of aluminum and iron exceeded the SSSLs and ESVs in most samples. Beryllium and cobalt also exceeded background screening values in most samples collected. Barium exceeded the SSSLs, background screening values, and ESVs in the sample from location PPMP-233-GP06. Manganese exceeded the SSSLs, background screening values, and ESVs in samples collected from locations PPMP-233-GP02, PPMP-233-GP04, and PPMP-233-GP06.

No herbicides, pesticides, explosives, PCBs, VOCs, or SVOCs were detected in the surface or depositional soil samples collected.

11.3.3.2 Subsurface Soil Sampling

Subsurface soil samples were collected for chemical analysis from six soil boring locations at the Fill Area West of Iron Mountain Road and Range 19. Subsurface soil samples were collected from borings at various intervals at depths ranging from 8 to 12 feet bgs. Sampling locations are shown in Figure 11-1. Analytical results are presented in Table 11-4.

Metals. Twenty-one metals were detected in the subsurface soil samples collected. Three metals (arsenic, iron, and thallium) exceeded the SSSLs in most samples collected; however, most of these metals were within background screening values. Various thallium results were flagged with a "B" data qualifier signifying that the compound was also detected in an associated laboratory or field blank.

Beryllium, cobalt, copper, nickel, and zinc exceeded the background screening values in most samples. Barium and manganese exceeded the SSSLs and background screening values in the sample collected from location PPMP-233-GP03, and iron exceeded both the background screening value and SSSL in the samples collected from locations PPMP-233-GP03 and PPMP-233-GP04. Aluminum and chromium concentrations exceeded the SSSLs in the samples collected from locations PPMP-233-GP04 and PPMP-233-GP06. Cadmium, mercury, selenium, and silver were also detected at concentrations above background screening values in the sample collected from location PPMP-233-GP03.

Volatile Organic Compounds. Four VOCs were detected in the subsurface soil samples collected; however, none of the reported concentrations exceeded the SSSLs.

Semivolatile Organic Compounds. Two SVOCs were detected in the subsurface soil samples collected; however, none of the SVOCs detected exceeded the SSSLs.

No herbicides, pesticides, explosives, or PCBs were detected in the subsurface soil samples collected.

11.3.3.3 Groundwater Sampling

Groundwater was sampled from one permanent well (PPMP-233-GP04) at the Fill Area West of Iron Mountain Road and Range 19. The final site-specific FSP proposed groundwater samples from the four wells installed at this site. Groundwater samples were not collected from three of the four permanent monitoring wells (PPMP-233-GP03, PPMP-233-GP05, and PPMP-233-GP06) because the wells were dry. Groundwater sampling locations are shown in Figure 11-1. Analytical results are presented in Table 11-5. Field parameter measurements are provided in Table 11-6.

Metals. Thirteen metals were detected in the groundwater sample collected. Chromium, iron, manganese, and nickel exceeded the SSSLs; however, none of the results exceeded the background screening values.

Pesticides. Four pesticides were detected in the groundwater sample collected. One pesticide (Aldrin) was detected at a concentration exceeding the SSSL.

No herbicides, explosives, PCBs, VOCs, or SVOCs were detected in the groundwater sample collected.

11.4 Fill Area Definition Activities

This section summarizes fill area definition activities conducted by IT at the Fill Area at Iron Mountain Road and Range 19. On the basis of the geophysical results, trenching was limited at this parcel and no fill material borings were drilled.

11.4.1 Trenching Activities

Four exploratory trenches were proposed at the Fill Area West of Iron Mountain Road and Range 19 to characterize the horizontal extent of the fill material; however, the on-site geologist determined that a "t" shaped trench located in the center section of the fill area interpreted from the geophysical survey would better delineate fill material at the site. The modified trench

excavations consisted of one 50-foot trench (T233-1A) crossed by a second trench 30 feet long (T233-1B). The trenches were excavated to depths of 5 and 6 feet bgs. Trench locations are illustrated on Figure 11-1. A summary of trenching data is provided in Table 11-7. Trenching procedures are described in Section 2.8. Trenching logs are presented in Appendix I.

Fill material was not observed in either trench; however, a bullet blank, a piece of glass, and a piece of metal were observed on the surface at the trench locations.

11.4.2 Fill Material Borings

No fill material borings were installed as a part of the fill area definition activities; however, additional soil samples were collected from SI soil boring location PPMP-233-GP05. SI soil boring locations are shown in Figure 11-1.

There was no Fill Material sampling conducted for Fill Area West of Iron Mountain Road and Range 19.

11.5 Extent of Fill Material

IT has estimated the vertical and horizontal extent of fill material at the Fill Area West of Iron Mountain Road and Range 19 based on information gathered from previous site investigations, surface debris observation, and trenching and boring activities discussed in this report. The fill area covers approximately 1.1 acres, as shown in Figure 11-3. On the basis of the trench data, there is no indication of fill material below ground surface at this parcel.

11.6 Variances

Three variances to the fill area work plan were recorded during the completion of the fill material borings, groundwater sampling, and trenching activities at the Fill Area West of Iron Mountain Road and Range 19. The variances did not alter the intent or results of the proposed scope of work. Variances to the FSSFSP are summarized in Table 11-8 and are included in Appendix K.

12.0 Field Activities and Results for the Stump Dump, Parcel 82(7)

12.1 Introduction

The Stump Dump, Parcel 82(7) is located in the central portion of the Main Post (Figure 1-2). This parcel is identified as a category 7 site in the EBS and, thus, is considered an area not previously evaluated or that requires additional investigation (ESE, 1998). The original CERFA parcel boundary for the Stump Dump is shown in Figure 12-1. Site investigation and fill area definition activities were conducted at this parcel to delineate the vertical and horizontal extent of waste fill and to characterize the fill material. This section presents the results of those activities.

The Stump Dump falls within a "Possible Explosive Ordnance Impact Area" shown on Plate 10 of the FTMC Archive Search Report, Maps (USACE, 1999b) and, thus, the UXO avoidance procedures described in Section 2.1 were implemented at this parcel.

There are no records of disposal activities that may have occurred at the Stump Dump and, thus, the SI was conducted to determine the presence or absence of COPCs at this site. The SI included field sampling and analysis and monitoring well installation activities. Following the SI, fill area definition activities were conducted to characterize the vertical and horizontal extent of the waste fill and to characterize the fill material. Fill definition activities included the installation of borings to investigate the depth of fill material. Because the existing site cover defines the extent of fill material, no geophysical investigations were necessary.

12.2 Site Description

The Stump Dump is an open area with a soil cover with engineered features such as terraced decks and engineered slopes and low vegetation (grass and shrubs). The area around the site is mostly developed or wooded. There are no flowing streams on or near the site. Surface runoff is controlled by engineered drainage structures that divert surface water from the covered surface of the fill area. Several retention ponds or stilling basins were constructed around the covered fill area to control the velocity and turbidity of waters leaving the site. The boundaries of the site are irregular and the Stump Dump is approximately 1,000 feet long (north to south) and over 700 feet in width (east to west) (Figure 12-1). The site covers approximately 10 acres. Shallow groundwater at the site is probably controlled by surface drainage and topography. Site elevation ranges from approximately 910 feet to 1,055 feet above msl.

The Stump Dump is now inactive but was used as a disposal site between 1985 and 1998. The Stump Dump was originally intended to receive storm debris (trees, branches, and flood soil). Uncontrolled and unauthorized dumping of items, including construction debris (sheet rock and concrete), batteries, tires, paint cans, refrigerators, landscaping trash, and other materials also occurred at this location. After its closure in 1998 or 1999, the Stump Dump was covered with soil and vegetation and the retention ponds were installed.

12.2.1 Site Geology

The soil type in the area of the Stump Dump is Stony Rough Land, sandstone (Ss). This miscellaneous land type consists of rough mountainous areas with many outcrops of sandstone and quartzite bedrock, loose rock fragments, and scattered patches of sandy soil material. It also includes rock escarpments on higher parts of the Choccolocco and Coldwater Mountains where quartzite of the Weisner formation is common. Slopes generally are more than 25 percent. The soil material is generally shallow over bedrock. Runoff is high, infiltration is slow, and the capacity for available moisture is low. This land type is low in natural fertility.

A north-south trending imbricate thrust fault (Jacksonville Fault) is mapped by the Geological Survey of Alabama along the middle portion of the parcel. Bedrock west of the fault is mapped as Shady Dolomite. Bedrock east of the fault is mapped as the Chilhowee Group (Osborne et al., 1997). A geologic map of the area, including the Stump Dump is presented in Figure 1-3.

12.2.2 Site Hydrogeology

IT installed eight permanent groundwater monitoring wells at the Stump Dump in November and December 1998. During boring and well installation activities, groundwater was encountered at depths ranging from 43 feet to 142 feet bgs. Groundwater was encountered in shale at FTA-82-MW01 and FTA-82-MW02, and in weathered shale at FTA-82-MW08. Groundwater was encountered in consolidated sandstone at FTA-82-MW04 at a depth of 120 feet bgs.

Static groundwater levels were measured in all the groundwater monitoring wells on March 13, 2000. Table 12-1 summarizes measured groundwater elevations at the Stump Dump. A potentiometric surface map was constructed from the March 2000 data and is shown in Figure 1-4. Groundwater flow at the site is predominantly to the southwest. The groundwater contours show that well FTA-82-MW03 is influenced by groundwater flow from the slope east of FTA-82-MW03. The potentiometric surface likely reflects natural topography that existed prior to borrowing and landfilling activities. Calculated average horizontal hydraulic gradients across the site range from approximately 0.14 to 0.17 ft/ft.

12.2.3 Surface Hydrology

Surface water is diverted off the landfill cover into a man-made drainage feature that flows northeast to southwest and forms the eastern and southern perimeter of the Stump Dump, Parcel 82(7).

The man-made drainage feature discharges into an intermittent stream that flows to the southwest and eventually discharges into Cane Creek.

12.3 Site Investigation

The SI was conducted prior to the fill area definition investigation to characterize the source of COPCs in various site matrices, determine the nature and extent of contamination, and to provide data to evaluate the level of risk to human health and the environment posed by releases of the COPCs.

This section summarizes SI activities conducted by IT at the Stump Dump, including environmental sampling and analysis, and monitoring well installation activities.

12.3.1 Well Installation

As described in Section 12.2.2, eight permanent wells were installed at the Stump Dump to collect groundwater samples for laboratory analysis. The well/groundwater sample locations are shown in Figure 12-1. Table 12-2 summarizes construction details of the wells installed at the Stump Dump. The well construction logs are included in Appendix C. Permanent well installation techniques are described in Section 2.6.2.

12.3.2 Environmental Sampling

The SI included field work to collect eight surface soil samples, eight subsurface soil samples, eight groundwater samples, five surface water samples, five sediment samples, and six depositional soil samples. Sample collection techniques are described in further detail in Section 2.3. Sample collection logs and chain-of-custody records are provided in Appendix B. Analytical results were compared to the residential human health SSSLs, background screening values, and ESVs, as presented in Tables 12-3, 12-4, and 12-5.

12.3.2.1 Surface and Depositional Soil Sampling

Surface soil samples were collected for chemical analysis from eight locations and depositional soil samples were collected from six locations at the Stump Dump. Sampling locations are

shown in Figure 12-1. Surface and depositional soil samples were collected from the upper 1-foot of soil shown in Figure 12-1. Analytical results are presented in Table 12-3.

Metals. Twenty-one metals were detected in the surface and depositional soil samples collected. Eight of these metals (barium, beryllium, cobalt, copper, mercury, nickel, selenium, and zinc) exceeded the background screening values and ESVs in various samples; however, the concentrations did not exceed the SSSLs. The concentrations of three metals (aluminum, manganese, and iron) exceeded the background screening values, SSSLs, and ESVs in various samples collected.

Volatile Organic Compounds. Eight VOCs were detected in surface soil samples and depositional soil samples collected. Except for the concentration of trichloroethene, detected in the samples collected from locations FTA-82-MW04 and FTA-82-MW05, none of the VOCs detected were present at a concentration exceeding the ESVs. Additionally, the two trichloroethene results were flagged with a "B" data qualifier signifying that the compounds were also detected in an associated laboratory or field blank. None of the VOCs detected were present at a concentration exceeding the SSSLs.

Semivolatile Organic Compounds. Four SVOCs were detected in the surface and depositional soil samples collected. None of the SVOCs detected were present at a concentration exceeding the SSSLs or ESVs.

Pesticides. Four pesticides were detected in the surface soil samples and depositional soil samples collected. Only two surface and one depositional soil sample contained detectable concentrations of pesticides. No pesticides were detected in any other surface soil samples or depositional soil samples collected. None of the detected pesticides were present at a concentration exceeding the SSSLs. One pesticide (4,4'-DDE) detected in the depositional soil sample collected from location FTA-82-DEP02 was present at a concentration that exceeded the ESV .

12.3.2.2 Subsurface Soil Sampling

Subsurface soil samples were collected for chemical analysis from eight soil borings at the Stump Dump, as shown in Figure 12-1. Subsurface soil samples were collected at various intervals at depths ranging from 7 to 54 feet bgs. Analytical results are presented in Table 12-4.

Metals. Twenty-two metals were detected in subsurface soil samples collected. The concentrations of seven metals (aluminum, arsenic, barium, chromium, iron, manganese, and thallium) exceeded the SSSLs in various samples; however, with the exception of aluminum, barium, chromium, iron, and manganese, the concentrations of these metals were within background screening values.

Volatile Organic Compounds. Eight VOCs were detected in the subsurface soil samples collected. None of the detected VOCs were present at a concentration exceeding the SSSLs.

Semivolatile Organic Compounds. Thirteen SVOCs were detected in subsurface soil samples collected. The subsurface soil sample collected from location FTA-82-MW03 had a detectable concentration of benzo(a)pyrene exceeding the SSSL.

No herbicides, pesticides, explosives, or PCBs were detected in the subsurface soil samples collected.

12.3.2.3 Groundwater Sampling

Groundwater was sampled from the eight permanent wells at the Stump Dump. Sampling locations are shown in Figure 12-1. Analytical results are presented in Table 12-5. Field parameter measurements are provided in table 12-6.

Metals. Fifteen metals were detected in the groundwater samples collected. The concentrations of five metals (aluminum, barium, iron, manganese, and thallium) exceeded the background screening values and SSSLs. The thallium results were flagged with a "B" data qualifier.

Metals exceeding the SSSLs and background screening values in the groundwater samples collected from locations FTA-82-MW03, FTA-82-MW05, and FTA-82-MW08 are attributed to the high turbidity (greater than 100 NTU) in these samples (Table 12-6).

Volatile Organic Compounds. Nine VOCs were detected in the groundwater samples collected. None of the VOCs detected were present at a concentration exceeding the SSSLs.

Semivolatile Organic Compounds. Two SVOCs were detected in the groundwater samples collected. None of the SVOCs detected were present at a concentration exceeding the SSSLs.

No herbicides, pesticides, explosives, or PCBs were detected in the groundwater samples collected.

12.3.2.4 Surface Water Sampling

Five surface water samples were collected at the Stump Dump. The surface water samples were collected from ponds at sample locations shown in Figure 12-1. Field parameter measurements are provided in Table 12-6. Analytical results were presented in Table 12-7.

Metals. Fifteen metals were detected in the surface water samples collected. The concentrations of thallium detected in three of the surface water samples collected exceeded the background screening value, ESV, and SSSL; however, all results were flagged with a "B" data qualifier. The concentration of arsenic detected in one of the samples exceeded the background screening value and the SSSL. The concentrations of aluminum (one sample) and beryllium (two samples) exceeded the background screening values and the ESV; however, the beryllium results were flagged with a "B" data qualifier.

Volatile Organic Compounds. One VOC was detected in the surface water samples collected; however, it was not present at a concentration that exceeded the SSSLs or ESVs.

There were no SVOCs, pesticides, herbicides, PCBs or explosives detected.

12.3.2.5 Sediment Sampling

Five sediment samples were collected for chemical analysis at the same locations as the surface water samples shown in Figure 12-1. Analytical results are presented in Table 12-8.

Metals. Nineteen metals were detected in the sediment samples collected. None of the metal concentrations detected exceeded the SSSLs. Copper was detected in the sediment sample collected from location FTA-82-SW/SD01 at a concentration exceeding the ESVs and background screening values. Nine other metals were detected at concentrations exceeding the background screening values.

Volatile Organic Compounds. Three VOCs were detected in the sediment samples collected. None of the VOCs detected exceeded the SSSLs. Trichlorofluoromethane was detected in four of the sediment samples at concentrations exceeding the ESVs.

Semivolatile Organic Compounds. Fourteen SVOCs were detected in the sediment samples collected. None of the SVOCs detected exceeded the SSSLs. Six SVOCs (benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, phenanthrene, and pyrene) were detected in the sample collected from location FTA-82-SW/SD02 at concentrations exceeding the ESVs.

Pesticides. Three pesticides were detected in one of the sediment samples collected. Pesticides were not detected in the four remaining sediment samples collected. None of the pesticides detected exceeded the SSSLs. Two pesticides (4,4'-DDE and 4,4'-DDT) were detected at concentrations exceeding the ESVs.

There were no herbicides, PCBs or explosives detected.

12.4 Fill Area Definition Activities

This section summarizes fill area definition activities conducted by IT at the Stump Dump, including fill material borings and fill material sampling and analysis. IT collected fill material samples in March 2000 at this site to determine the vertical extent of the waste fill and to characterize fill materials.

The lateral extent of the fill area is defined by the existing soil cover with engineered features and, thus, the excavation of trenches was not necessary at this site.

12.4.1 Fill Material Borings

Three soil borings were installed at the Stump Dump to determine the vertical extent of the fill material and to collect a sample of the fill material for chemical analysis. Fill material borings were installed at depths ranging from 3 to 7.5 feet. Sampling locations are shown in Figure 12-1. Soils logs of fill material borings are included in Appendix C, and include detailed characterization of the fill material and soils. Fill material boring procedures are described in Section 2.7. Results of the findings for the fill material borings are summarized in Table 12-9. A fill material sample was not collected for chemical analysis from location FA-82-SB01 because the presence of fill could not be confirmed. Analytical results were compared to SSSLs and background screening values, as presented in Table 12-10. Sample collection logs and chain-of-custody records are provided in Appendix B.

Metals. Eighteen metals were detected in the fill material samples collected. The concentrations of five metals (arsenic, chromium, iron, manganese, and thallium) exceeded the

SSSLs; however, with the exception of chromium detected in the sample collected from location FA-82-SB03, the concentrations of these metals did not exceed background screening values.

Volatile Organic Compounds. Four VOCs were detected in the fill material samples collected. None of the detected VOCs were present at a concentration exceeding the SSSLs. No herbicides, explosives, or PCB's were detected in the fill material samples collected.

Semivolatile Organic Compounds. Seventeen SVOCs were detected in the fill material samples collected. The fill material sample collected from location FA-82-SB03 had detectable concentrations of benzo(a)pyrene and dibenz(a,h)anthracene which exceeded the SSSLs.

Pesticides. Five pesticides were detected in the fill material sample collected. None of the detected pesticides were present at a concentration exceeding the SSSLs.

No herbicides, explosives, or PCBs were detected in the fill material samples collected.

12.5 Extent of Fill Material

IT has estimated the vertical and horizontal extent of fill material at the Stump Dump based on information gathered from the site investigation and boring activities discussed in this report. The horizontal extent of fill is defined by the existing soil cover and encompasses an area of approximately 10 acres, as shown in Figure 12-2. The average depth of fill material, estimated from the boring log data, is approximately 8 feet bgs.

12.6 Variances

Two variances to the site-specific FSP were recorded during the completion of the SI at the Stump Dump. The variances did not alter the intent or results of the proposed scope of work. The variances to the site-specific SFSP are summarized in Table 12-11 and are included in Appendix K.

13.0 Summary

IT prepared this SI and FADR to document activities performed at FTMC. The report summarizes the results of investigations to determine the nature and extent of fill material and also identifies whether chemicals of concern are present in the environmental media. Additionally, the report provides site-specific data to support recommendations in the EECA for these landfills and fill areas. The Army has identified the following 10 landfill/fill areas, consisting of 12 parcels, at FTMC as sites of former disposal actions from a variety of mission-related activities. Based on data presented in the FADR, the extent of fill has been defined for each landfill and fill area as follows:

- ***Landfill No. 1, Parcel 78(6).*** This parcel was the subject of an RI by SAIC; therefore, no additional SI activities were necessary. Fill area definition activities consisted of geophysical surveys, trenching, and fill material boring installation. Based on the results of the investigations, the fill material covers approximately 6.3 acres and the average depth of fill is estimated to extend to 11.5 feet bgs.

- ***Landfill No. 2, Parcel 79(6).*** This parcel was included in the SAIC RI. In addition, surface soil sampling was performed at the site by IT. Fill area definition activities consisted of geophysical surveys, trenching, and fill material boring installation. Based on the results of the investigations, the fill material covers approximately 5.6 acres and the average depth of fill is estimated to extend to 8 feet bgs.

- ***Landfill No. 3, Parcel 80(6).*** This parcel was included in the SAIC RI and supplemental remedial investigations are currently being performed to define the extent of groundwater contamination. Fill area definition activities consisted of trenching and fill material boring installation. Based on the results of the investigations, the fill material covers approximately 22.8 acres and the average depth of fill is estimated to extend to 17 feet bgs.

- ***Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5).*** These parcels constitute an active permitted landfill; therefore, no additional SI or fill area definition activities were performed. The fill material covers approximately 59.2 acres.

- ***Fill Area North of Landfill No. 2, Parcel 230(7).*** This parcel was the subject of an SI by IT. Fill area definition activities consisted of geophysical surveys, trenching, and fill material boring installation. Based on the results of the investigations, the fill material covers approximately 2.4 acres and the average depth of fill is estimated to extend to 15 feet bgs.

- ***Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7).*** These parcels were the subject of SIs by IT. Fill area definition activities consisted of geophysical surveys, trenching, and fill material boring installation. Based on the results of the investigations, the total fill material at both parcels covers approximately 6.5 acres. The average depth of fill at Parcel 227(7) is estimated to extend to 8 feet bgs; the average depth to fill at Parcel 126(7) is estimated to extend to 3 feet bgs.

- ***Fill Area Northwest of Reilly Airfield, Parcel 229(7).*** This parcel was the subject of an SI by IT. Fill area definition activities consisted of geophysical surveys, trenching, and fill material boring installation. Based on the results of the investigations, the fill material covers approximately 5.9 acres and the average depth of fill is estimated to extend to 8 feet bgs.

- ***Fill Area at Range 30, Parcel 231(7).*** This parcel was the subject of an SI by IT. Fill area definition activities consisted of trenching, and fill material boring installation. The fill material covers approximately 3.9 acres and consists of fill piles overlying the ground surface. The average thickness of fill is estimated at 4 feet.

- ***Fill Area West of Iron Mountain Road and Range 19, Parcel 233(7).*** This parcel was the subject of an SI by IT. Fill area definition activities consisted of geophysical surveys, trenching, and fill material boring installation. Based on the Environmental Baseline Survey, the fill material boundary covers approximately 1.1 acres. However based on SI and fill area definition activities, no appreciable fill was observed.

- ***Stump Dump, Parcel 82(7).*** This parcel was the subject of an SI by IT. Fill area definition activities consisted of fill material boring installation. The fill material covers approximately 10 acres and the average depth of fill is estimated to extend to 8 feet bgs.

14.0 References

Cloud, P.E., Jr., 1966, ***Bauxite Deposits of the Anniston, Fort Payne, and Asheville Areas, Northeast, Alabama***, U.S. Geological Survey Bulletin 1199-O, 35p.

Environmental Science and Engineering, Inc., (ESE), 1998, ***Final Environmental Baseline Survey (EBS), Fort McClellan, Alabama***, prepared for U.S. Army Environmental Center, Aberdeen Proving Grounds, Maryland, January.

Fort McClellan (FTMC), Calhoun County, Alabama, 1995, Letter from Ronald Levy to Mr. Andy Baker (Alabama Department of Environmental Management), Results from Annual Landfill Gas Monitoring, Fort McClellan, Alabama.

IT Corporation (IT), 2000a, ***Engineering Evaluation/Cost Analysis, Fill Area Definition Work Plan, Parcels 78(6), 79(6), 80(6), 81(5), 175(5), 230(7), 227(7), 229(7), 126(7), 231(7), 233(7), and 82(7)***, Fort McClellan, Calhoun County, Alabama, February.

IT Corporation (IT), 2000b, ***Final Site-Specific Ordnance and Explosives Work Plan, Fill Area North of Landfill No. 2, Parcel 230(7); Fill Area at Range 30, Parcel 231(7); and Fill Area West of Iron Mountain Road and Range 19, Parcel 233(7) For Support of Construction Activities***, August.

IT Corporation (IT), 2000c, ***Final Human Health and Ecological Screening Values and PAH Background Summary Report***, July.

IT Corporation (IT), 2000d, Letter to Ellis Pope (USACE) from Jeanne Yacoub (IT), Groundwater Resampling Results, August.

IT Corporation (IT), 1998a, ***Final Site-Specific Field Sampling Plan and Site-Specific Safety and Health Plan Attachments Range 4A Fog Oil Drum Storage; Range 24A Multi-Purpose Range, Smoke Area BVZ; Smoke Area S; Smoke Area R; Stump Dump; Old Incinerator Building 5170; Former Smoke Area Choccolocco Corridor; Former Smoke Area South Slope Morgan Mountain, Parcels 88, 108, 124, 108, 106, 105, 82, 125, 107, and 159***, October.

IT Corporation (IT), 1998b, ***Final Site-Specific Field Sampling Plan and Site-Specific Safety and Health Plan Attachments, Directorate of Engineering and Housing (DEH) Compound; Motor Pool Area 3100 S of 23rd St., Post Garbage Dump North of Reilly Airfield; Former Chemical Laundry and Motor Pool Area 1500, Parcels 64, 1, 147, 72, 27, 28, 126, 94, 132, 133 & 134***, October.

IT Corporation (IT), 1998c, ***Final Site Investigations Site-Specific Field Sampling Plan and Site-Specific Field Safety and Health Plan Attachments, Fill Area East End Reilly Airfield, Fill Area Northwest of Reilly Airfield, Drain Field, Fill Area at Range 30, Parcels 227, 229, 236, 231***, December.

IT Corporation (IT), 1998d, ***Site-Specific Field Sampling Plan and Site-Specific Safety and Health Plan Attachments, Fill Area West of Range 19, Parcel 233***, December.

IT Corporation (IT), 1998e, ***Final Installation-Wide Sampling and Analysis Plan (SAP), Fort McClellan, Calhoun County, Alabama***, Revision 1, August.

IT Corporation (IT), 1998f, ***Final Installation-Wide Work Plan (WP), Fort McClellan, Calhoun County, Alabama***, August.

IT Corporation (IT), 1998g, ***Long-Term Monitoring Report-First Quarter Report for Landfills 1,2, and 3, Fort McClellan, Calhoun County, Alabama***, May.

Moser, P.H., and DeJarnette, S.S., 1992, ***Groundwater Availability in Calhoun County, Alabama***, Geological Survey of Alabama Special Map 228.

Osborne, W.E., 1999, Personal communication concerning regional geology in Calhoun County, Alabama with John Hofer, IT Corporation.

Osborne, W.E. and Szabo, M.W., 1984, ***Stratigraphy and Structure of the Jacksonville Fault, Calhoun County, Alabama***, Geological Survey Circular 117.

Osborne, W.E., Szabo, M.W., Copeland, C.W., Jr., and Nethery, T.L., 1989, ***Geologic Map of Alabama***, Geological Survey of Alabama Special Map 221, scale 1:500,000, 1 sheet.

Osborne, W.E., Szabo, M.W., Copeland, C.W., Jr., and Nethery, T.L., 1997, ***Preliminary Geologic Map of Anniston 7.5', Calhoun County, Alabama***, Geological Survey of Alabama.

Planert, Michael, and Pritchett, James L. Jr., 1989, ***Geohydrology and Susceptibility of Major Aquifers to Surface Contamination in Alabama, Area 4***, U.S. Geological Survey, Water Resources Investigation Report 88-4133, prepared with the Alabama Department of Environmental Management, Tuscaloosa, Alabama.

Science Applications International Corporation (SAIC), 2000, ***Final Fort McClellan Remedial Investigation/Baseline Risk Assessment Report***, July.

Science Applications International Corporation (SAIC), 1998, ***Final Background Metals Survey Report, Fort McClellan, Alabama***.

Science Applications International Corporation (SAIC), 1995, ***Draft Fort McClellan Remedial Investigation Report***, August.

Science Applications International Corporation (SAIC), 1993, ***Fort McClellan Site Investigation Report***, August.

Szabo, M.W., Osborne, W.E., Copeland, C.W., Jr., and Nethery, T. L., compilers, 1988, ***Geologic Map of Alabama,*** Alabama Geological Survey Special Map 220, scale 1:250,000, 5 sheets.

U.S. Army Corps of Engineers (USACE), 1999a, ***Statement of Work for Task Order CK09, Engineering Evaluation/Cost Analysis (EE/CA) for Landfills at Fort McClellan, Alabama,*** May.

U.S. Army Corps of Engineers (USACE), 1999b, ***Archives Search Report, Maps, Fort McClellan, Anniston, Alabama,*** June.

U.S. Army Corps of Engineers (USACE), 1994, ***Requirements for the Preparation of Sampling and Analysis Plan, Engineer Manual EM-200-1-3***, September.

U.S. Army Environmental Hygiene Agency (USAEHA), 1976, ***Geohydrologic Study No. 38-26-0912-87, U.S. Army Chemical and Military Police Centers and Fort McClellan,*** August.

U.S. Department of Agriculture (USDA), 1961, ***Soil Survey, Calhoun County, Alabama***, Soil Conservation Services, Series 1958, No. 9. September.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), 1998, and 1999, Unedited Local Climatological Data, Anniston, Alabama, January 1998-December 1999.

U.S. Environmental Protection Agency (EPA), 1990, ***Installation Assessment, Army Closure Program, Fort McClellan, Anniston, Alabama*** *(TS-PIC-89334),* Environmental Photographic Interpretation Center Report (EPIC), Environmental Monitoring Systems Laboratory.

Warman, J.C. and L.V. Causey, 1962, ***Geologic Map of Calhoun County, Alabama***, U.S. Geological Survey of Alabama County Report 7, plate 2, 1962.

Weston, Roy F., Inc., 1990, ***Final USATHAMA Task Order 111, Enhanced Preliminary Assessment, Fort McClellan, Anniston, Alabama,*** prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, December.

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	silvex
3D	3D International Environmental Group
AB	ambient blank
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
Abs	skin absorption
ABS	dermal absorption factor
AC	hydrogen cyanide
ACAD	AutoCadd
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
AdE	Anniston and Allen stony loam, 10 to 25 percent slope
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEL	airborne exposure limit
AET	adverse effect threshold
AF	soil-to-skin adherence factor
AHA	ammunition holding area
AL	Alabama
ALAD	-aminolevulinic acid dehydratase
amb.	Amber
amsl	above mean sea level
ANAD	Anniston Army Depot
AOC	area of concern
APEC	areas of potential ecological concern
APT	armor-piercing tracer
AR	analysis request
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AWARE	Associated Water and Air Resources Engineers, Inc.
AWWSB	Anniston Water Works and Sewer Board
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor; bioconcentration factor
BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
bgs	below ground surface
BHC	betahexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIRTC	Branch Immaterial Replacement Training Center
bkg	background
bls	below land surface
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare; body weight
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
CAB	chemical warfare agent breakdown products
CAMU	corrective action management unit
CBR	chemical, biological and radiological
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CG	carbonyl chloride (phosgene)
CGI	combustible gas indicator
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
cm	centimeter
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; contaminant of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical(s) of potential concern
COPEC	chemical(s) of potential ecological concern
CPSS	chemicals present in site samples
CQCSM	Contract Quality Control System Manager
CRDL	contract-required detection limit
CRL	certified reporting limit
CRQL	contract-required quantitation limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
CSM	conceptual site model
CT	central tendency
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
'D'	duplicate; dilution
D&I	detection and identification
DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
°C	degrees Celsius
°F	degrees Fahrenheit
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate

List of Abbreviations and Acronyms *(Continued)*

DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EB	equipment blank
EBS	environmental baseline survey
EC_{50}	effects concentration for 50 percent of a population
ECBC	Edgewood Chemical/Biological Command
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
EPRI	Electrical Power Research Institute
ER	equipment rinsate
ERA	ecological risk assessment
ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESMP	Endangered Species Management Plan
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
ET	exposure time
EU	exposure unit
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FD	field duplicate
FDA	U.S. Food and Drug Administration
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFS	focused feasibility study
FI	fraction of exposure
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
FMP 1300	Former Motor Pool 1300
FOMRA	Former Ordnance Motor Repair Area
Foster Wheeler	Foster Wheeler Environmental Corporation
Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/ft	feet per foot
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m^3	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index
HPLC	high performance liquid chromatography
HNO_3	nitric acid
HQ	hazard quotient
HQ_{screen}	screening-level hazard quotient
hr	hour
H&S	health and safety
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
'I'	out of control, data rejected due to low recovery
IATA	International Air Transport Authority
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IS	internal standard
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System™

List of Abbreviations and Acronyms (Continued)

'J'	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
K_{ow}	octonal-water partition coefficient
L	lewisite; liter
l	liter
LBP	lead-based paint
LC	liquid chromatography
LCS	laboratory control sample
LC_{50}	lethal concentration for 50 percent population tested
LD_{50}	lethal dose for 50 percent population tested
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MB	method blank
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCPA	4-chloro-2-methylphenoxyacetic acid
MCS	media cleanup standard
MD	matrix duplicate
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg/day	milligram per kilogram per day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
min	minimum
MINICAMS	miniature continuous air monitoring system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MMBtu/hr	million Btu per hour
MOGAS	motor vehicle gasoline
MP	Military Police
MPA	methyl phosphonic acid
MPM	most probable munition
MQL	method quantitation limit
MR	molasses residue
MRL	method reporting limit
MS	matrix spike
mS/cm	millisiemens per centimeter
mS/m	millisiemens per meter
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
MWI&P	Monitoring Well Installation and Management Plan
Na	sodium
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NCRP	National Council on Radiation Protection and Measurements
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NEW	net explosive weight
NFA	No Further Action
NG	National Guard
NGP	National Guardsperson
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
Ni	nickel
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada
NRHP	National Register of Historic Places
ns	nanosecond
N-S	north to south
NS	not surveyed
NSA	New South Associates, Inc.
nT	nanotesla
nT/m	nanoteslas per meter
NTU	nephelometric turbidity unit
nv	not validated
O_2	oxygen
O&G	oil and grease
O&M	operation and maintenance
OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBMS	performance-based measurement system
PC	permeability coefficient
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PES	potential explosive site
Pest.	pesticides
PETN	pentarey thritol tetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes

List of Abbreviations and Acronyms (Continued)

PM	project manager
POC	point of contact
POL	petroleum, oils, and lubricants
POW	prisoner of war
PP	peristaltic pump; Proposed Plan
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRG	preliminary remediation goal
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
'R'	rejected data; resample
R&A	relevant and appropriate
RA	remedial action
RAO	removal action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RDX	cyclonite
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RfC	reference concentration
RfD	reference dose
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTC	Recruiting Training Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
SA	exposed skin surface area
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	Schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SINA	Special Interest Natural Area
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SOP	standard operating procedure
SOPQAM	U.S. EPA's *Standard Operating Procedure/Quality Assurance Manual*
sp	poorly graded sands; gravelly sands
SP	submersible pump
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPM	sample planning module
SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
SRM	standard reference material
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source-term concentration
STD	standard deviation
STEL	short-term exposure limit
STL	Severn-Trent Laboratories
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWMU	solid waste management unit
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
THI	target hazard index
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TR	target cancer risk
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
UF	uncertainty factor
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School

USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards

SAIC – Data Qualifiers, Codes and Footnotes, 1995 Remedial Investigation

N/A – Not analyzed

ND – Not detected

Boolean Codes

LT – Less than the certified reporting limit

Flagging Codes

9 – Non-demonstrated/validated method performed for USAEC

B – Analyte found in the method blank or QC blank

C – Analysis was confirmed

D – Duplicate analysis

I – Interfaces in sample make quantitation and/or identification to be suspicious

J – Value is estimated

K – Reported results are affected by interfaces or high background

N – Tentatively identified compound (match greater than 70%)

Q – Sample interference obscured peak of interest

R – Non-target compound analyzed for but not detected (GC/MS methods)

S – Non-target compound analyzed for and detected (GC/MS methods)

T – Non-target compound analyzed for but not detected (non GC/MS methods)

U – Analysis in unconfirmed

Z – Non-target compound analyzed for and detected (non-GC/MS methods)

Qualifiers

J – The low-spike recovery is low

N – The high-spike recovery is low

R – Data is rejected